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ORGAN OF THE AMERICAN ASSOCIATION OF THE HISTORY OF MEDICINE AND THE JOHNS HOPKINS INSTITUTE OF THE HISTORY OF MEDICINE

Founded by HENRY E. SIGERIST

Editor—OWSEI TEMKIN

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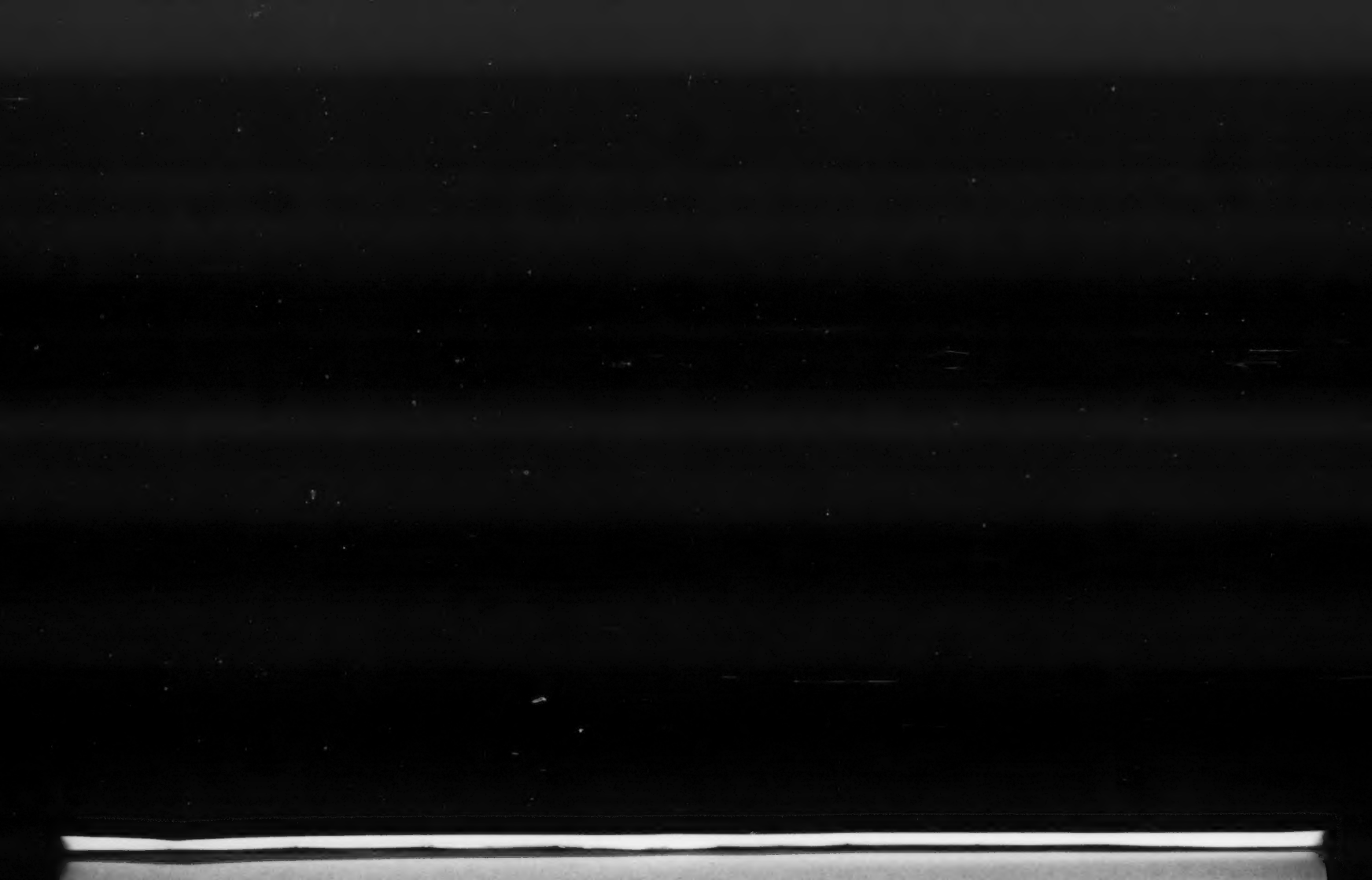

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AN OUTLINE OF A HISTORY OF IDEAS IN NEUROLOGY[1]

W. RIESE

AN ORGAN OF LIFE

The Sect of the Neuro-Pathologists

The name of neuro-pathologists was given to a medical sect of the eighteenth century which assigned to the nervous system an all-determining role in health and disease. There were several reasons for the rise of this school of thought. First of all, there was the disappointment left by the once all-powerful humoral pathology. Once the solidum had entered the scene and anatomy come to the fore, the nervous system necessarily had its share in the new doctrine of disease. But the specific function which the neuro-pathologists ascribed to the central nervous system in the genesis of disease, was not the result of neuro-anatomical or neuro-pathological investigations; these were made much later. True, the all-pervading structure and endless ramifications of the nervous system seemed to give the strongest support to the new doctrine, competing with the blood for the chief position in the human frame.[2] If one compares the two illustrations

[1] The history of ideas in neurology is not the history of neurology. Nor is an outline a complete record of all ideas ever presented by neurologists. What is intended, is a selective and critical presentation of the basic concepts conceived and applied for the purpose of making intelligible the correlation of nervous function with nervous structure.

[2] The chief position of the blood is most conspicuous in the following passage of

in Vesalius' *Fabrica* of the circulatory and of the nervous systems (Figs. 1 and 2), one realizes the easiness with which one could pass from the blood to the nerves as to the true center of life and disease. These pictures reflect two of the greatest chapters in the history of the medical doctrines, namely that of humoral- and that of neuro-pathology. Since antiquity, motion and sensation were ascribed to the nervous system as its proper functions. The neuro-pathologists did not depart from this tradition, and it was logical that in a doctrine of disease, stressing the all-importance of the nervous system, motion was given the highest rank among all factors underlying health and disease. Finally, Newtonian cosmology and the tendency to describe all changes in nature in terms of motion, was in the mind of all at the time the doctrine of the neuro-pathologists was conceived.

The new doctrine was indeed a doctrine of life which was at the same time a doctrine of movement. It was the result of a most rational attempt to give to the diversity of life phenomena their most elementary and most objective expression. G. E. Stahl, whose place in medical history seems to be fixed irrevocably by his animism, must however, also be reckoned among the fore-runners of the neuro-pathologists. His doctrine of disease contained indeed a strongly rational element. All life processes were expressed in terms of *movement*.[8] All movements, though different as to species, direction, rythm and effects were believed to be instrumental conditions of life. Prevention of decay, removal of destructive matter, repair and healing were described as types of movement. Motion thus being the *primary* factor in all life processes, sensation was also expressed in terms of movement, namely as the result of two movements, one being transmitted by the object to the sense organ, the other produced in the sense organ by the soul.

Harvey's *Anatomical Disquisition on the Motion of the Heart*; "The heart, consequently, is the beginning of life; the sun of the microcosm, even as the sun in his turn might well be designed the heart of the world; for it is the heart by whose virtue and pulse the blood is moved, perfected, made apt to nourish, and is preserved from corruption and coagulation; it is the household divinity which, discharging its function, nourishes, cherishes, quickens the whole body, and is indeed the foundation of life, the source of all action." (Chapter VIII, R. Willis' translation, Everyman's Library, p. 57.)

[8] The soul was the moving agent, thus, the source of life. This was not animism as yet. Had Stahl introduced into his organic system of movements a moving power as a principle of *interpretation*, refraining from any qualifying definition or description of a presumptive and fictitious *entity*, he would have stayed within the limits of a rational interpretation of organized nature. But he understood the soul to be a conscious, intelligent, reasoning and premeditating principle, and here were the sources of his animism. The soul, he taught, is entirely *autocratic* and no matter can compete with it. True cure is always a spontaneous one; Stahl was a strong adherent of the vis curatrix naturae of the ancients.

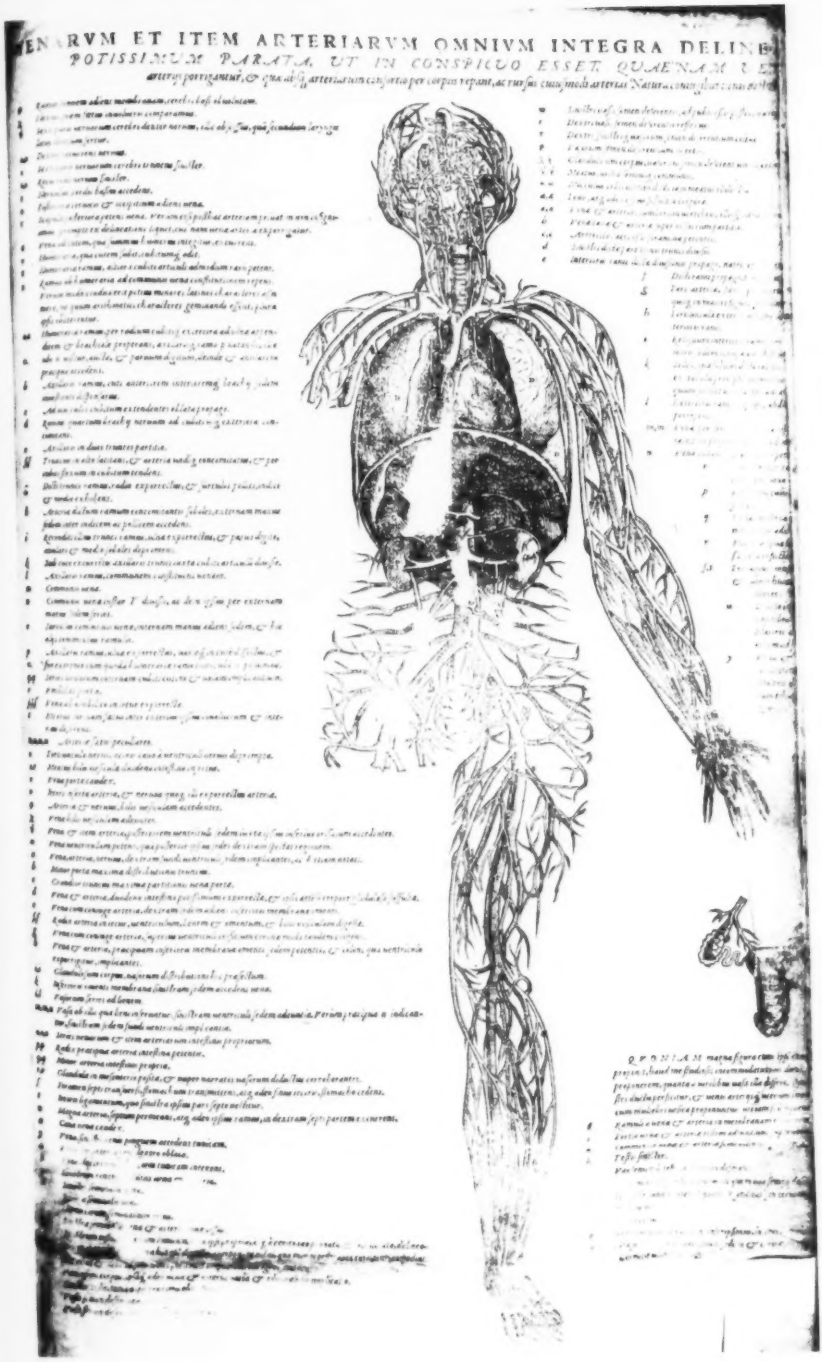


FIG. 1. The circulatory system, from Vesalius' *Fabrica*, ed. 1555.

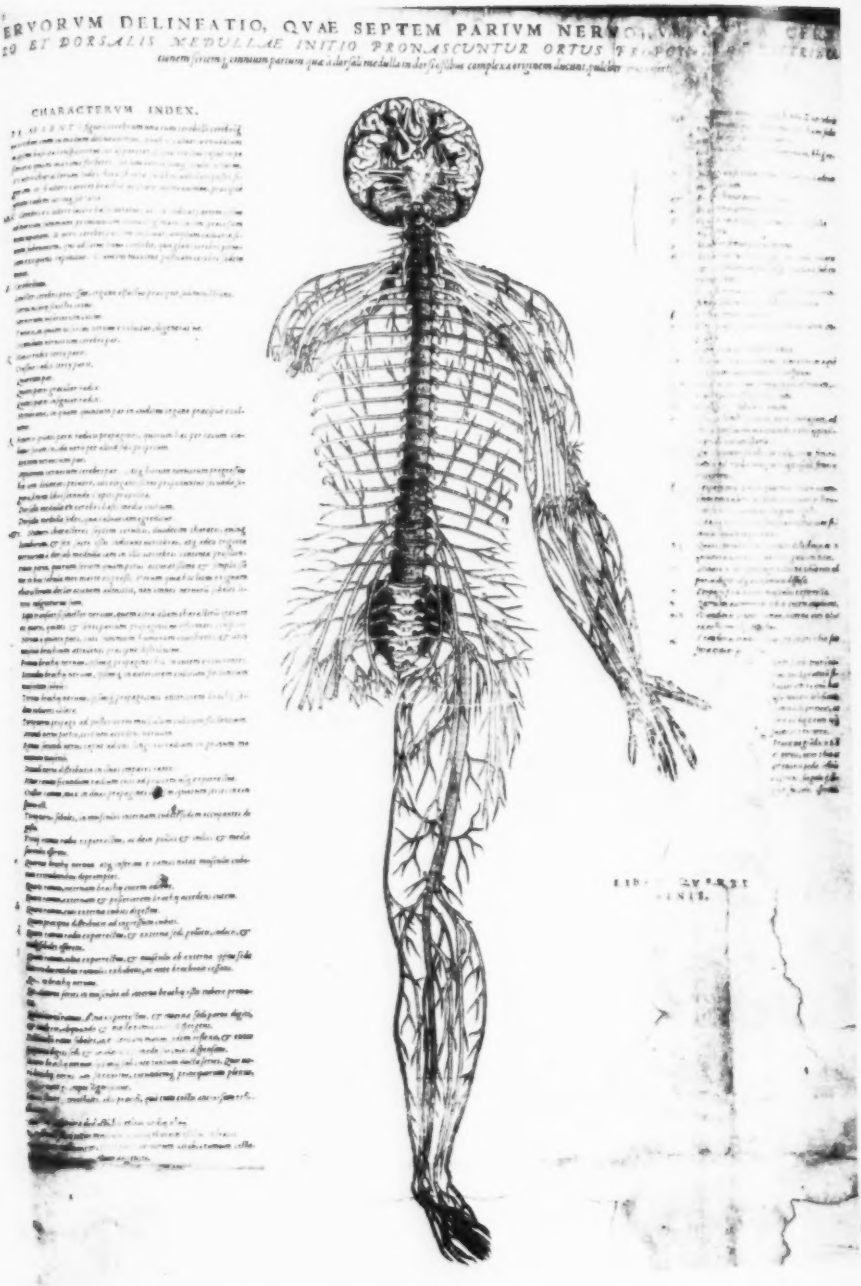
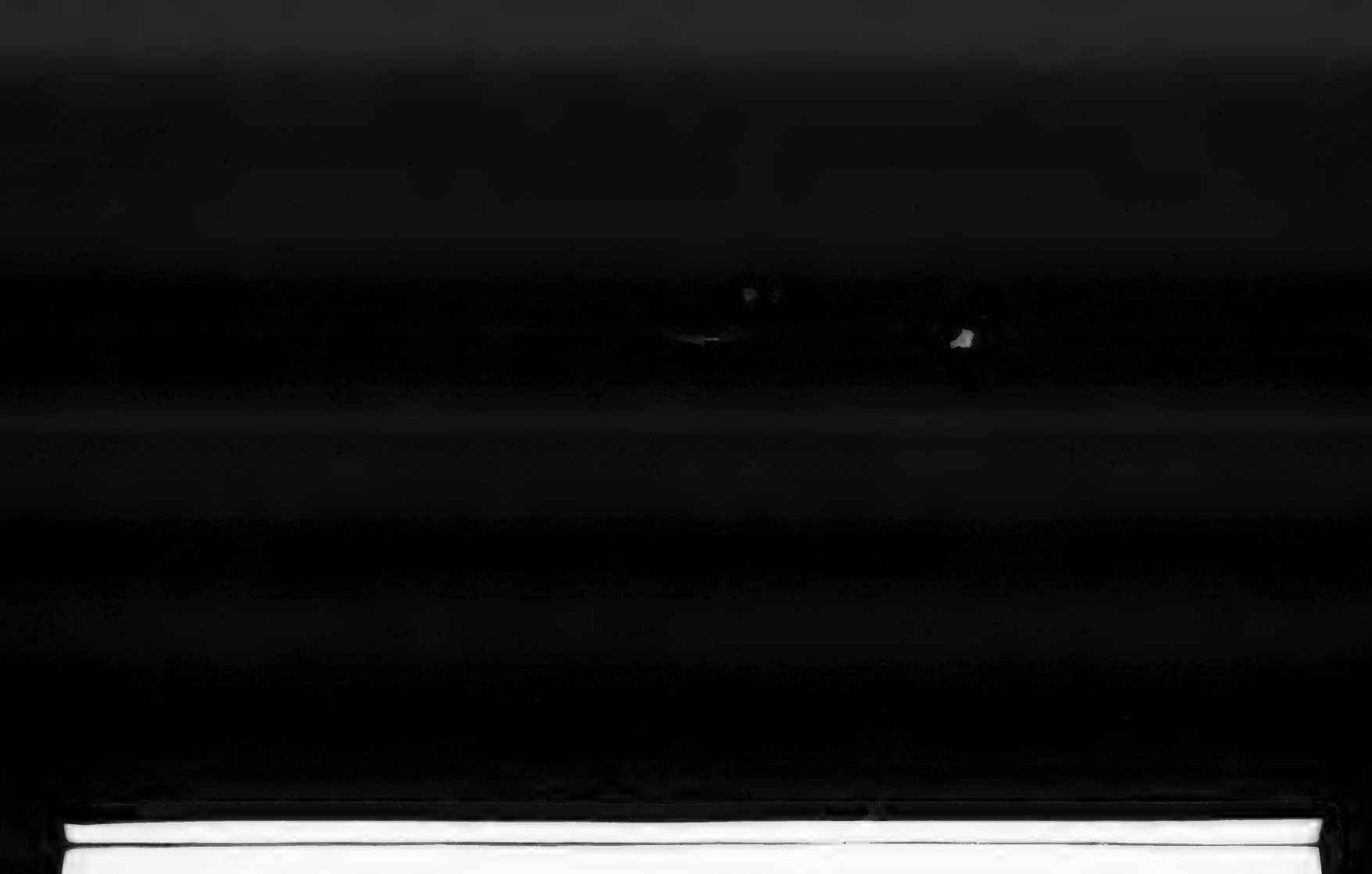


Fig. 2. The nervous system, from Vesalius' *Fabrica*, ed. 1555.



The founder and spiritual head of the sect of the neuro-pathologists was Cullen. He made "the state and affections of the primary moving powers" the explanatory principle of the phenomena of the animal economy in health and sickness,[4] and he also adopted this principle for clinical purposes. He explicitly referred to F. Hoffmann as his predecessor, quoting a most significant passage from the *Medicina Rationalis Systematica*, in which the famous Halle clinician gave his "Genealogia morborum ex turbato solidorum et fluidorum mechanismo."[5] Cullen exposed the purely hypothetical nature of the morbid changes which the fluids[6] of the human body may undergo. He concluded that our study must be focussed on the motions of the animal system, "upon that state of which the phenomena of diseases do more certainly and generally depend."[7] He resolutely eliminated "the many hypothetical doctrines of the Humoral Pathology," which, as he said, disfigured both Hoffmann's "and all the other systems which have hitherto prevailed." "The affections of the motions and moving powers of the animal economy, must certainly be the leading inquiry in considering the diseases of the human body."[8] In most general terms he declared "LIFE, so far as it is corporeal, to consist in the excitement of the nervous system, and especially of the brain, which unites the different parts, and forms them into a whole."[9] Cullen distinguished different states or degrees of mobility of the nervous fluid[10] in the brain. He called them states of "excitement" and "collapse." Thus, he assigned to the central nervous system a chief position in the hierarchy of the organs under normal as well as pathologic conditions; pathology became synonymous with neuro-pathology.[11] This can best be seen in his doctrine of fever;[12] the significant terms he used in this doctrine were debility, stimulus and spasm. Gregory, one of the more outstanding followers of Cullen, went so far as to state "that all the

[4] *First Lines of the Practice of Physic*, Edinburgh, 1791, p. 23.

[5] "... atque hinc universa pathologia longe rectius atque facilius EX VITIO MOTUUM MICROCOSMICORUM IN SOLIDIS, quam EX VARIIS AFFECTIONIBUS VITIOSORUM HUMORUM, deduci atque explicari possit, adeoque omnis generis aegritudines internae, ad PRAETERNATURALES GENERIS NERVOSI AFFECTIONES sint referendae" (l. c., p. 20).

[6] l. c., pp. 32-33.

[7] l. c., p. 33.

[8] l. c., p. 47.

[9] *Institutions of Medicine*, Part I, third edition, Edinburgh, 1785, p. 101.

[10] This might be considered as a concession to humoral pathology. Similarly he agreed "that the fluids of the human body suffer various morbid changes and that upon these, diseases may primarily depend."

[11] *First Lines of the Practice of Physics*, Edinburgh, 1791, pp. 90-91.

[12] l. c., pp. 90-91.

living solids may be justly esteemed as parts of the same kind, to which the name *nervous system*, is accustomed to be placed.[13]

It is not the intention of this paper to tell the complete story of this sect, the different versions of its doctrine and its numerous followers.

This school of thought came to its end towards the middle of the nineteenth century, when so many traditions and heritages vanished almost suddenly from medical history. But before this happened, the philosophical fundamentals of this doctrine were submitted to a profound analysis and criticism by that genius who contributed most decisively to the destruction of the neuro-pathological sect: Rudolf Virchow.

An Antipode: Rudolf Virchow

Virchow's thought passed through two stages, separated from one another by the very short interval of only a few years. Each stage in Virchow's individual thought reflects at the same time a major step in medical history. In 1849,[14] when discussing the basic principles of humoral- and neuro-pathology, he still struggled for an appropriate expression of that "general law," which is behind the blood and the nerves, which precedes and determines the differentiation of the tissues. At that moment, his intention was still focussed on that primary movement which he believed to be immanent and proper to all living beings endowed or not with a nervous system, thus, proper to animals and plants. He called it the vital movement or the spiritus rector, anima structrix et vegetativa or archeus. This was pure vitalism.

It is true that in the final analysis his cellular pathology (1858) was also intended to be a *theory of life*. Life, he taught, is action. But this action is not carried on by any center susceptible of anatomical demonstration. The opposite view, evidently still very strong at his time and according to which the nervous system is the real center of life, encounters that great difficulty, he said, that the very apparatus which is supposed to bring about unity reveals in itself the same splitting into an infinite number of separate centers, which is seen in the rest of the body. This was indeed most judicious reasoning. Still more remarkable was the fact, that the pathologist, entirely aware of the "philosophical" nature implied in the idea of a center of life, denied this unity to any structure; he wanted it restricted to the "immaterial soul." This unity, however, he said, is but

[13] *Gregory's Conspectus.* A literal interlineal translation of the first ten chapters of Gregory's conspectus medicinae theoreticae; with the original text etc. etc. By Robert Venables. XIV, 122 pp. London, Sherwood, Gilbert and Piper, 1836.

[14] *Die Einheitsbestrebungen in der wissenschaftlichen Medizin*, Berlin, G. Reimer, 1849.

an idea which cannot be made the subject of empirical research. Moreover, if we understand by soul the vital principle, the soul cannot be denied to any of the parts; this again, he said, makes it impossible to localize the vital principle. He saw the naturalist constantly embarrassed by the consciousness of his own self, teaching him indeed a unity which he was unable to discover in organized nature outside himself. Virchow saw no other issue than to abandon unity and to conceive the organism as a *compound* of innumerable minute centers. He thus reached the second and the final stage of his thought.[15] Here then are the true sources of his cellular pathology. Now the cell became the ultimate constituent element of life in health and disease. The organism, he said is a *sum* of vital units, a kind of social institution. R. Virchow realized that this means reciprocity of the parts; but he gave preference to the specific activity of the elements, thus opening the road to a pre-eminently local and regional concept of disease.[16] No empirical research, no cellular structure, no cellular process or change could have taught him such a far reaching conclusion, which is indeed a theory of life and a result of R. Virchow's philosophical thought. He saw that unity was not to be found in anatomical structures, that it should be left to all the parts, but that it was only in the consciousness of our own self. Would he have made the step to interpret organized beings by *analogy* with our own consciousness (refraining at the same time from any *dogmatic* statement as to their real nature), he would have saved unity, though only as a principle of interpretation. With this restriction in mind the omni-presence of life or soul in all of the parts does not contradict unity in principle and action.

There can be no doubt that in Virchow's concept of disease a chief position was assigned to the local factor among all factors constituting disease.[17] Disease, he said, is no unity. The " clinical picture," stimulating such a unity, is but a figurative, imaginative and abstract unity. In fact he believed that most diseases are multiple, according to their numerous sites and foci. Subsequently, cure of universal or generalized diseases

[15] The *Cellular Pathology* appeared, in 1858. But already in 1852 Virchow's thought had reached its mature stage. Indeed, in his " Ernaehrungseinheiten und Krankheitsherde," (*Virchow's Archiv*, 4:378, 1852), we read: "Every cell is a definite unit, having in itself the cause and the principle of its life and existence and having a definite autonomy relative to the rest of the world."

[16] " The localizing principle is the basic principle of modern medicine," *Ueber den Wert des pathologischen Experiments.* Berlin, A. Hirschwald, 1899, p. 16.

[17] See W. Pagel: *Virchow und die Grundlagen der Medizin des neunzehnten Jahrhunderts.* Jena, G. Fischer, 1931.—The Speculative Basis of Modern Pathology and the Philosophy of Pathology. *Bull. Hist. Med.* XVIII: 1-43, 1945.

means elimination of all foci. In no branch the regional factor seemed to be more powerful than in the doctrine of nervous disease which has almost become identical with the doctrine of cerebral localization. Though localizing efforts were very old,[18] it was not by chance that the century which produced Rudolf Virchow and cellular pathology, saw at the same time the rise of the doctrine of cerebral localization.[19]

The Contemporaries

Once again Sherrington's *Integrative Action of the Nervous System* (1906) brought the thesis of nervous dominance in all life processes to the fore. In its new shape the thesis was understood to be a physiological one and to spring from experiment. The power to transmit states of excitement generated within the nervous cells represent but one of their specific features. " In the multicellular animal, especially for those higher reactions which constitute its behavior as a social unit in the natural economy, it is nervous reaction which par excellence integrates it, welds it together from its components, and constitutes it from a mere collection of organs an animal individual. This integrative action in virtue of which the nervous system unifies from separate organs an animal possessing

[18] See M. Neuburger: *Die historische Entwicklung der experimentellen Gehirn- und Rueckenmarksphysiologie vor Flourens*, Stuttgart, F. Enke, 1897.

[19] We learn from Claude Bernard's posthumous work, *Principes de Médecine Expérimentale*, published only very recently (Paris, 1947) that he was among the few who rejected Virchow's critical views on the neuropathological sect and that he never ceased to be a strong adherent of the doctrine of this sect. Claude Bernard believed the nervous system not only to dominate the humors but all physiological, pathological and therapeutical mechanisms. This system, he said, mediates animal life. All functions and all diseases must be related to the nervous system; without the nerves there would be no sympathy, no general reaction and no fever. Whoever denies the all-importance of the nervous system, does vegetative pathology. Just like the neuro-pathologists of the eighteenth century, Claude Bernard was strongly impressed with the all-pervading structure of the nervous system, and it seems that his adherence to the teaching of the sect was strongly supported by anatomical reasonings. It has become a part of our teaching that his "piqûre" opened the road to the regulatory activity of the central nervous system in metabolic processes. He also considered the central nervous system the organ of mental and moral functions, the determining influence of which in health and disease he stressed emphatically. Thus, he also took over that second heritage of modern neurology the sources of which are to be found in the doctrine of the cerebral seat of the soul which now adopted its new name of "psychic functions." It is probably not too well-known, that Hughlings Jackson considered himself indebted to Claude Bernard for his principles of hierarchy and release which later became so important in British neurophysiology; Jackson acquitted himself of this debt on two occasions (*Selected Writings*, 2 vols., London, Hodder and Stoughton, 1931-1932, I, 184 and II, 428).

solidarity, an individual, is the problem before us in these lectures." [20] ". . . It works through living lines of stationary cells along which it dispatches waves of physico-chemical disturbance, and these act as releasing forces in distant organs where they finally impinge. Hence it is not surprising that nervous integration has the feature of relatively high speed, a feature peculiarly distinctive of integrative correlation in animals as contrasted with that of plants, the latter having no nervous system in the ordinary sense of the word . . ." [21] The problem whether the " welding together " of a unit or an individual from its components, is a purely physiological one, has been discussed at previous occasions.[22] To this writer, the foreword to the 1947 edition of the *Integrative Action* marks an unmistakable evolution in Sherrington's thought. " If the nature of an animal be accepted as being that of a whole presupposed by all its parts, then each and every part of the animal is integrative." [23] This remarkable and far reaching statement implies a devaluation of the almightiness of the nervous system. The unifying action is no longer left to one part of the body exclusive of others; it is shifted to every part. We are reminded of the doctrine of omnipresence of the soul; though in modern terms.

The doctrine of the sect of the neuro-pathologists was also revived for *clinical* purpose. Once again, disease was made a nervous process. Ricker's " Relationspathologie " will be selected as a most instructive example. It was a doctrine of disease conceived on the sole ground of irritation. " Relationspathologie " was meant to be a causal pathology. Nervous stimulation was believed to be the determining factor in all diseases, the nervous system the first organ to be involved in any disease.[24] Evidently this

[20] *The Integrative Action of the Nervous System*, 1947, New Haven, Yale University Press, p. 2.

[21] l. c., p. 3.

[22] W. Riese: Critique et Interprétation Rationelle du Principe de l'Intégration. *Arch. Suisses de Neur. et de Psych.*, 44: 313-319, 1940. ——: The Principle of Integration, *J. Nerv. and Ment. Dis.*, 96: 296-312, 1942.

[23] *The Integrative Action of the Nervous System*, 1947, New Haven, Yale Univ. Press, p. XIII.

[24] G. Ricker's doctrine may best be exemplified by his concept of cerebral haemorrhage. Here he adopted the views now shared by most of the contemporaries that the mechanical factor alone (rupture of a vessel) cannot explain the mechanism of cerebral haemorrhage. Cerebral haemorrhage must be traced back to stimulation of the nerves of the vessels. On strong nervous stimulation, the constrictors become paralyzed and the capillaries dilated. After a short period of acceleration the blood stream decreases and finally stops (stasis), due to the constriction and occlusion of the adjacent arterial segment. During this stasis, erythrocytes pass through the wall of the vessels, using openings which might not be pre-existing but only form when necessity arises. Similar views on the commanding

doctrine neglected the true nature of causality as it is displayed in an organism. Indeed, the organism is built on the model of a reciprocity of the parts; there is no fixed one-way causality. The concept of causality we use in our interpretation of the organism does not serve the purpose to fix the chronological sequence of natural phenomena by which the irreversible *dependence* of a series of events is established. In the doctrine of the organism and of disease we state the *interdependence* of the members of the whole. This interdependence does not admit of an irrevocable or irreversible arrangement of the members according to rank or time. But Ricker's attempt to write a pathology on the sole basis of irritation was not the first of the kind. The first and very systematic attempt to interpret disease in terms of excitation, was made by John Brown.[25] Brown's pathology, though in many respects different from that of his predecessors, was still a neuro-pathology, since he claimed the central nervous system to be the seat of excitability. Just as Brown, Ricker failed to realize the *historical* nature of disease. All attempts to reduce disease to the action of a single physiological principle, such as irritation, must fall short of the evolutional element in diseases. The history of diseases teaches us an ever changing involvement of the organs, and in this history no organ can claim the exclusive right of opening once and for all the sequence of events. This holds true for the nervous system. In fact, at any moment, we suffer from more than just one source. Finally, since irritation is never lacking in a living organism, disease becomes a matter of degree; in Brownism as well as in Ricker's doctrine, there remains no fundamental difference between health and disease, physiology and pathology.

Movements and Impressions

According to a more sober principle of interpretation of nervous function the central nervous system is conceived simply as an organ, having a function of its own, but no permanent privilege with regard to other organs. It is related to movements and impressions as to the two fundamental manifestations of animal life, but life itself is not the object of this interpretation and correlation. Though this sober principle of interpretation can be traced back to antiquity, it was only in the second half of the nineteenth century that it took shape as a systematic attempt to

position of the nervous system in general, the determining role of irritation in the genesis and course of the inflammatory process, are held by Speransky (*A Basis for the Theory of Medicine*. Translated and edited by C. P. Dutt, 2nd ed., New York: International Publishers Co., 1943, 418 pp., 46 plates).

[25] *The Elements of Medicine*. Philadelphia, 1814.

adopt the representation of movements and impressions as the basic function of the central nervous system, to describe and to classify nervous diseases according to this principle. The names of M. H. Romberg and Hughlings Jackson stand out prominently in this chapter of the history of ideas in neurology. It is of utmost importance to realize the new and different meaning given to the term motion in this reshaped doctrine. Motion was no longer derived from the *postulate* that all changes in animate and inanimate nature are due to movements. This postulate was dictated by the truly rational attempt to give to the changes in nature their most elementary expression, devoid of all subjective and fortuitous qualities and thus admitting of quantitative analysis. But now, motion was understood solely to be the perceptible changes in the *spatial* relationship of parts of the body, occurring intentionally or not. This interpretation was later supplemented by the change in *chronological* relationship as seen by the different types of disturbed movement (paralysis) according to the different stages of disease or the natural history of cerebral shock (diaschisis), restitution and compensation. It was and still is the ideal of those who adopt this interpretation of nervous function to avoid any term involving other than spatial and chronological factors. What stood in the way of this ideal was the factor of *volition* which has been linked with movement and its disturbances. Paralysis, one of the fundamental motor symptoms resulting from disease of the central nervous system, has been defined as loss of voluntary motor power; we now relate it to a special structure, namely the pyramidal system. But volition is a psychological or a metaphysical and not a physiological term. It is a "mind" process. Previous generations considered volition to be a part of the "soul." If anything could arouse doubt as to the existence of a specific structure or seat of mind or soul, it is the constant change to which this seat was submitted in the march of time. Soemmerring's endeavor to make the ventricular fluid an organ of the soul (1796)[26] was the last survival or revival of the medieval tradition to make the humors the seat of mind. Then, to the solid parts of the central nervous system was left irrevocably the exclusive privilege of harboring the soul, and the cerebral hemispheres finally emerged as the sole organ of mind. It is generally believed that Thomas Willis was the first to establish a distinction between the nerves destined to voluntary motions and those which preside over the functions independent of the will. He placed the origin of the latter in the cere-

[26] Riese, The 150th Anniversary of S. T. Soemmering's Organ of the Soul. *Bull. Hist. Med.* 20: 310-321, 1946.

bellum, and that of the nerves of voluntary motions in the cerebrum. Haller suggested that the cause of animal motion resides in the muscular fibre itself. To perform its contraction this fiber needs only a stimulus in the muscle submitted to the will, this stimulus is the nervous power the sources of which he referred to the brain.[27]

It was Flourens among the physiologists and Marshall Hall among the clinicians who considered the divisions of the central nervous system in their relation to mind processes, more specifically to volition, thus paving the way to the cerebral localization of psychic phenomena. The historical role of Flourens has become that of an opponent to cerebral localization. The detrimental effect which his experiments had on Gall's once so popular doctrine of the " faculties " and their seats explains indeed Flourens' fame as an antilocalistic pioneer. But besides this criticism Flourens was definitely localistic. He declared localization of functions by means of localization of organs to be the final purpose of his entire work.[28] The nervous system, he taught, is not homogeneous, its various parts having functions of their own, none of them interfering with the others. Volition and perception have their seats in the hemispheres [29] (co-ordination in the

[27] It seems that several of his followers admitted that this power is produced in the whole nervous system. The commissioners in charge (Humboldt, Hall, Percy and Cuvier) to make a report on Legallois' *Experiments on the Principle of Life* to the Institut de France stated that this admission was made "without direct proofs." They also held that Prochaska, who placed the sensorium commune in both the brain and the medulla spinalis, "was very far from suspecting the true functions of the medulla spinalis." They wanted full credit to be given to Legallois for the discovery that the spinal marrow furnishes the principle of life and of energy which animates the whole body, and which Legallois understood to be identical with the principle of sensation and voluntary motion.

[28] " La localisation des propriétés par la localisation des organes est effectivement le but de tout cet ouvrage. C'est par cette double localisation et des organes et des propriétés que je suis parvenu d'abord à distinguer, dans le système nerveux, deux ordres de parties, les parties susceptibles d'exciter immédiatement la contraction musculaire, et celles qui n'en sont pas susceptibles. . . ." (*Recherches Expérimentales*, 1824; p. XXV.)

[29] Unfortunately he committed himself to a localization of *functions*, instead of limiting his localizing efforts to a localization of *symptoms*, the only legitimate doctrine of cerebral localization in experimental brain-physiology and brain-pathology. Since brainless animals have lost their sensations, drives and intellectual functions, he concluded that these qualities have their seats in the cerebral hemispheres. In dealing with these qualities and their seats his universalistic views came to the fore. He believed all of them to be a unitary faculty residing in a unitary organ. ". . . Toutes ces facultés, toutes ces sensations, tous ces instincts, ne constituent qu'une faculté essentiellement une, et résidant essentiellement dans un seul organe" (l. c., p. XIV). A lesion of the cerebral hemispheres, wherever located, does not interfere with these intellectual faculties and sensations, provided the lesion does not reach beyond certain limits. If it becomes too extensive, all of these functions are lost, wherever the seat of the lesion. These conclusions imply the concept of

cerebellum and the immediate excitation of muscular contraction in the spinal cord and the nerves).[30] Thus, a psychological, if not a metaphysical criterium was adopted as a principle of classification of neuro-anatomical units. It was inevitable, that Cuvier in his report on Flourens' work, presented to the Académie Royale des Sciences, objected to Flourens' conclusions and terminology, reducing the result to the statement that the cerebral hemispheres are but a unitary receptacle where the visual and auditory sensations can be "consumed" and become perceptions.[31]

The cerebrum was believed by Marshall Hall to be the "seat of the soul and of mind."[32] The functions belonging to the true spinal system were believed by him to be totally opposed to the cerebral functions. The true spinal marrow was "the special (but not the only) seat and center of the *vis nervosa*" (Haller). Here actions are always "excited," "reflex" and unconscious, therefore never spontaneous. We still labor under this heritage and the grouping of neuro-anatomical structures according to their presumptive relation to psychical processes.

The name of Pflueger stands out in the early history of the struggle for a purely physiological formula of the functions of the nervous system. He objected to the distinction between volitional and automatic as well as to a classification of the central structures according to their presumable relation to the soul. What he tried as a physiologist, H. Jackson accom-

substitution first conceived and enunciated by Flourens. "Les lobes cérébraux concourent effectivement, par tout leur ensemble, à l'exercice de leurs fonctions, il est tout naturel qu'une de leurs parties puisse suppléer à l'autre, que l'intelligence puisse conséquemment subsister ou se perdre par chacune d'elles" (l. c., p. 234).

[30] "Les diverses parties du système nerveux ont donc toutes des propriétés distinctes, des fonctions spéciales, des rôles déterminés; nulle n'empiète sur l'autre. Le nerf *excite*; la moelle épiniere *lie*; le cervelet coordonne; les lobes cérébraux *veulent* et *sentent*. De l'indépendance des organes dérive l'indépendance des phénomènes" (l. c., p. X).

[31] I am indebted to Dr. O. Temkin for the knowledge of a most interesting and significant passage in Flourens' *De l'Unité de Composition* (1865). Adopting with Legallois the nervous system as the principle of life, the eminent French physiologist derived the form of the animal as a whole from the form of its nervous system: "La forme du système nerveux détermine donc la forme de tout l'animal, et la raison en est simple: c'est qu'au fond le système nerveux est tout l'animal en effet, et que tous les autres systèmes ne sont là que pour le servir et l'entretenir" (l. c., p. 123). He then used the various forms displayed by the nervous system in the animal realm, as principles of classification.

[32] The following quotation leaves no doubt that Marshall Hall really meant a spatial and local residence when speaking of "seat" of the soul: "Upon the cerebrum the soul sits enthroned, receiving the ambassadors, as it were, *from* without, along the *sentient nerves*; deliberating and willing, and sending forth its emissaries and plenipotentiaries, which convey its sovereign mandates, along the *voluntary nerves, to* muscles subdued to volition." (*Diseases and Derangements of the Nervous System*, London, 1841, p. 3.)

plished as a clinician. Brain and spinal cord, Pflueger said, originate from the same matrix and they consist of the same constituent elements. If the cerebral hemispheres were the sole seat of the psychic power, thus the true center of the nervous system, how could the cerebral hemispheres be entirely lacking in the lowest vertebrates (*Amphioxus lanceolatus*) and but the spinal cord remain, or at least an organ which basically is but a spinal cord? To assume that the higher animals alone have a soul, while the lower ones are only reflex-machines, is illogical, nobody being able to indicate the line of demarcation. Only after having studied and enunciated the laws of reflex activity in man, Pflueger passed to animal experiments.[33] He saw voluntary reaction even in fragments of the spinal cord and he might have been influenced by Legallois, who indeed believed the spinal marrow to be the seat of sensation and voluntary motion. Pflueger established the attainment of a given goal as a criterium of voluntary activity. If the same sequence of movements is performed in spite of their uselessness for this purpose, it is a reflex mechanism, deprived of consciousness, though not of innate purposefulness. It is true, that Pflueger did away with the mechanical nature of reflex activity, thus, with one of its oldest and strongest criteria; since then, the teleological nature of reflex activity has been definitely established by the British school of neuro-physiologists. But Pflueger's solution still remained precarious. Consciousness and volition are inner states. They can never be derived with certainty from *objective* behavior. At best we can proceed by *analogy*; but no animal experiment can teach me what really may be the inner state of an animal, decapitated or not, executing a certain movement, successful or not, in removing a stimulus.[34]

[33] Pflueger devoted much effort to show that the movements of a decapitated animal are not mechanical in nature. Therefore, he did not believe it to be an appropriate object for the study of reflex action. Since voluntary control can only be tested in the human being, he was convinced that the laws governing reflex activity can only be studied in man, and he selected his material from observations made by physicians on so-called reflex neuroses (spasms, convulsions, epilepsy, trismus, tetanus etc.). The contemporary neuro-physiologist, deriving the major part of his knowledge from animal experiments, will be impressed with an analysis and discovery of the laws of reflex activity made on *clinical* grounds. The historian of nervous function will remember that one of the fundamental and uncontested discoveries in neurophysiology, namely the motor character of the pre-central gyrus, was also made on the ground of clinical observations, by Hughlings Jackson. Among the contemporaries K. Goldstein must be cited as responsible for a study on purely clinical grounds of the laws presiding over the activity of the central nervous system.

[34] At any rate, from now on, Pflueger's name was linked with the "spinal soul." In 1877, 24 years after publication of the *Sensory Functions of the Spinal Cord of the Vertebrates*, he was somewhat more precautious, leaving it an insoluble question, "whether

The history of the autonomic nervous system reflects the same wavering between the same conflicting principles of interpretation which we saw at work since the days of the sect of the neuro-pathologists. To the autonomic nervous system was entrusted the task of bringing about "sympathy" or "consensus" thus, unity. To make this assumption plausible, one referred to the all-pervading structure of the autonomic nervous system; once again unity in action was derived from the diffuseness of the anatomic structures. But according to the more sober principle of interpretation, autonomic functions were nothing but movements, though involuntary ones; thence the name "involuntary nervous system." Thus, involuntary movements were correlated with the autonomic nervous system, but at the same time, with certain divisions of the somatic nervous system, a confusing situation which was not alleviated by the correlation of disturbed gestures, mimic, pantomimic and other involuntary movements such as tremor and athetosis, with the extra-pyramidal motor system, a recently explored division of the somatic nervous system. Of course, there is a difference between the involuntary (respiratory, circulatory etc. and similar) movements mediated by the autonomic nervous system and those mediated by the somatic and extra-pyramidal nervous system. But the very fact that involuntary movements have been related to so different divisions as the visceral and the somatic nervous systems, makes the classification of central structures according to the criterium of volition or its absence most insecure. Striking the final blow against the once firmly believed self-sufficiency and isolation of the autonomic nervous system (Bichat), Hughlings Jackson made the decisive step towards simplification by stating that "not only the movements ordinarily so-called, but the movements of arteries and the viscera are represented in the cerebrum." He arrived at this conclusion from the observation that gross disease, tumors for instance, of "the organ of mind," produce muscular, circulatory and visceral symptoms.[35] This was written in 1869. Let us

the purposeful, thus rational function accomplished by *all* cells, is only in the ganglion cells of the central nervous system illuminated by the bright day of consciousness, whereas the analogous functions of the other cells are deprived even of a dimly dawning consciousness, hidden to the cerebral consciousness because of a lack of communication between them." His final intention was now to explain all purposeful actions of the organism by an "absolute mechanics," making the assumption of a psyche as their *immediate* cause unnecessary. See also: F. Fearing, *Reflex Action. A Study in the History of Physiological Psychology*. Baltimore, Williams & Wilkins, 1930.

[35] *Selected Writings*, Vol. I, pp. 46-47. That he really intended to incorporate the visceral into the somatic nervous system, in order to facilitate a unitary concept of nervous function, can best be seen by the following quotation: "We have now, then, to add to the constitution of the units of the cerebrum nerve fibres to the heart, vessels, and

remember that in 1849, Claude Bernard had made his " piqûre " which for the first time had shown metabolic processes to be under the jurisdiction of the central nervous system. Factual evidences are now accumulating showing that autonomic functions are represented at almost all of the levels of the central nervous system, from the spinal cord to the cortex.[86]

But there was still the difficulty arising from the complicating element of volition, and the classification of central structures according to psychological criteria still remained in power, prohibiting a unitary concept of the structure and functions of the nervous system. Again it was Hughlings Jackson who made the most resolute effort to overcome the difficulty and to avoid any psychologic issue. Though contemporary with Pflueger, Jackson did no longer make use of the term " soul," now becoming obsolete. But Jackson did use the term voluntary which, however, he was most anxious to interpret in physiological terms; in fact, he expressed it in terms of movement. He was concerned with " the physics of the nervous system," and he declared the varying conditions of anatomical arrangements of nerve cells and fibers to be the subject of " neural physiology." The cerebral hemispheres, he said, are made up of nothing else than nervous arrangements for the co-ordination of impressions and movements.[87] They do not differ from the inferior centers, except as parts representing more intricate co-ordinations of impressions and movements in time and space. Thus, he re-stated what Pflueger had said, and he also stressed the basic identity of the central structures. Whether we deal with physical or psychic phenomena, the substratum is the same; no part of the central nervous system seems to be made for functions fundamentally different from those of other parts. But he went further than Pflueger. Whatever may be in the final analysis the relation of the neural process to mind, the anatomical substrata of mind contain an element of movement,[88] though only " nascent " movement. It is the latter which makes possible the relation of volition with the central nervous system. A voluntary part—as the hand for example—is one which has the greater number of *different* movements at the greater number of *different* intervals; shortly, the more " varied " uses. An automatic part—the chest, for example—is one which has the greater number of similar movements at

viscera, or rather probably to regions of the sympathetic system, from which these parts are supplied."

[86] See E. C. Hoff: The Role of the Cerebral Cortex in the Central Nervous Regulation of Cardiovascular Function, *Confinia Neurologica*. To be published.

[87] l. c., vol. I, p. 40.

[88] l. c., vol. I, p. 53.

the greater number of equal intervals; shortly, the more " similar " uses.[39] In disease the " voluntary " part suffers first and most severely; it is the last to recover. The full significance of Jackson's evolutionary scheme of motion has not been grasped as yet to its full extent; nor has it been used on a wide scale for clinical purpose, though it promises the greatest advantage for a systematic and logical analysis of the various types and stages of paralysis. The historian rediscovers in this evolutionary ascent from one type of motion to another the hierarchical order or organizing forces established by Kielmeyer.[40] One of these forces, irritability, he defined as the power to contract on stimulation and to produce movements. The more we ascend the scale of organized beings, the less lasting or permanent becomes irritability, but above all, the more *rapid*, *frequent* and *manifold* are its manifestations; irritability, though more transitory, admits in warm-blooded animals of more movements in equal times; this comes indeed very close to Jackson's definition of voluntary movements.

Jackson's interpretation brings to its end the endless discussion on voluntary and involuntary movements and their presumable sites. It liberates us from the classification of central structures according to their relation to consciousness and volition. It simplifies the whole problem of nervous function and its correlation with nervous structure by discussing nervous function in terms of movements and impressions, thus, making the problem a purely physiological one. It saves the localization of psychic phenomena, though only as a localization of movements. It is true that it makes the strongest demand on the self-denial of the neurologist; it simply wants him to leave consciousness and volition alone, precisely those two factors of which the neurologist as well as his patient have the most immediate knowledge; will it ever be possible to eliminate them from the history of disease? But we have no choice. If we want to correlate nervous functions with nervous structures, we must deprive disturbed and undisturbed functions of all features which do not adjust to the frame of space.

Specialization

According to the " neuro-pathologists " and their followers the central nervous system is the " primary moving power," source and seat of life. According to the more sober principle it is simply an organ of motion and sensation. Is it possible to reconcile these two conflicting principles? We

[39] l. c., vol. I, pp. 63, 66, 91.

[40] *Ueber die Verhaeltnisse der organischen Kraefte unter einander in der Reihe der verschiedenen Organisationen, die Gesetze und Folgen dieser Verhaeltnisse.* 1793.

can indeed follow the iatromechanics and the "neuro-pathologists" and express life in terms of motion, but we must deprive the central nervous system of the privilege of being the exclusive seat of life and motion. If, as already stated by Galen, life consists of movement, and if in an organism each part is a living part, movement, the most simple and most rational formula of life, cannot be denied to any part. The primary moving power which only reason postulates but which no sense and no instrument will ever discover, must be conceived as though present in all parts. In spite of this omnipresence of the moving principle and the universality of motion in a living organism, a role of its own can and must be left to the central nervous system. Haller [41] made the decisive step from a *universal* system of motion, as conceived by Francis Glisson, to a *regional* irritability, which Haller ascribed to the muscles as to its selective and exclusive organs, leaving sensibility to the nerves. He realized the enormous importance of the general problem involved in his new division of the parts of the human body, "by distinguishing those which are susceptible of irritability from those which are not." The problem involved is indeed that of the *origin and significance of organs as new trustees of functions previously left to animal life as such.* Haller restrained from discussing this problem, persuaded that "the source . . . lies concealed beyond the reach of the knife and microscope." Bichat [42] distinguished sensibility and motility as the only basic vital properties. He subdivided them into animal and organic types, organic sensibility and contractility being limited to the organs as to their exclusive sites, animal sensibility and contractility pre-supposing the existence of the central nervous system. His concept of the ganglionic nervous system as a whole of independent and self-sufficient centres might have suggested or at least facilitated his doctrine. He made no fundamental, but only a quantitative distinction between organic and animal sensibility, the latter being only the maximum of the first one ("distribuée à telle dose dans un organe, la sensibilité est animale, et à telle autre dose inférieure elle est organique"). Since he considered organic sensibility to be common to animal and plant, it seems, at first approach, that the advent of the nervous system is of no fundamental effect as to sensibility. But the text of the *Treatise on the Membranes* leaves but little doubt that Bichat saw in the central nervous system an organ of

[41] A Dissertation on the Sensible and Irritable Parts of Animals, by Albrecht V. Haller (English translation of 1755). Introduction by Owsei Temkin. *Bull. Hist. Med.*, 4: 651-699; 1936.

[42] *Recherches Physiologiques sur la Vie et la Mort.* Paris, 1805.

consciousness.[48] He obviously realized that the passage from organic to animal sensibility implied the passage from unconscious life to consciousness, from an organic or vital type of existence to an animated one. Like Haller, he did not want to explain this passage and "to attempt to raise the veil which conceals its principle." Bichat did, however, admit of a fundamental, and not only gradual distinction between organic and animal contractility and he referred to the types of movement and to their primitive characters as to discriminative criteria of organic contractibility. That he was unable to explain why organic contractibility could never be transformed into animal contractibility was obviously due to the fact that he identified animal contractibility with *voluntary* contractibility (which he related to the brain), thus introducing volition as the discriminative factor, foreign however, to physiology.

Since the days of Haller and Bichat there has been accumulated an ever increasing knowledge of the normal comparative, developmental and pathological structures of the central nervous system and its correlation with undisturbed and disturbed behavior. The central nervous system can now be looked upon as the source of a *special* type of motion, proper to those forms of animal life which are endowed with a central nervous system. Whenever affected by disease or injury, i. e. in emergencies, the central nervous system loses its specific function. Motion, in as much as it is preserved under those conditions, then falls back to a less special type; and it reveals again its origin from motion as from the basic and most general manifestation of animal life. The most confusing dialectics between motion as a most general character of animal life and motion as a mere function of the central nervous system can thus be brought to its end. The passage from motion as from a behavior represented universally to motion being a function related selectively and regionally to the nervous system, is one of the most dramatic and decisive steps ever made by organized nature. The final result is also expressed in terms of greater *differentiation*. But

[48] Already at this early stage of his scientific career he admitted two species of sensibility, organic sensibility and sensibility of relation. Organic sensibility is that faculty, by which an organ receives the impression of a body acting upon it, without transmitting this impression to the common centre. The sensibility of relation is that by which our organs are not only susceptible of receiving the impression of bodies which act upon them, but also of referring this impression to the sensorium commune; by this sensibility the animal is related to or connected with everything about it; on this depend the phenomena of the senses, of the brain, etc.; this presides over the exterior or animal life, thus denominated because animals alone possess it, the other life being common to them and to vegetables. When the organic sensibility is much augmented, it assumes the character of the sensibility of relation.

we should not forget that this makes a living being also more dependent, whereas what is generally called the more primitive stage, is at the same time the more flexible one, capable of throwing into action any of its parts, according to need. The part, used for a single purpose, losing its structure and function, thus, its very existence, as soon as the purpose is accomplished, is by this very fact not yet an organ, unless we admit of transitory organs, formed and abandoned when necessary. It is evident that its ever plastic organization opens to such a living being unrestricted and unlimited possibilities to cope with the requirements proper to its own sphere; in so far the " primitive " stage seems superior to the more differentiated one which has always to rely on the functions of its finished and immutable organs. Here are some factual evidences illustrating the specialization of motion due to the advent of the nervous system.

Locomotion is generally considered a type of motor behavior proper to species endowed with a central nervous system. Its appearance in close correlation with that of the central nervous system has been studied by G. E. Coghill[44] in *Amblystoma*, a low vertebrate and member of the Amphibia. With the attainment of locomotion *Amblystoma* passed one of the most significant landmarks in the evolution of animal behavior. The author states that it is no longer helplessly lodged in a fixed position and dependent upon fluctuations in the forces of nature around it for new experiences with the environment; it can now explore new worlds through the action of internal forces in response to stimulation from without, or under the urge of its own dynamic mechanism. The definite local reflexes as well as walking arise by a process of *individuation* out of the behavior pattern of the entire animal and not out of essentially or primarily independent units. The change one may expect motion to undergo when one passes from stages still lacking a central nervous system to those possessing it, has also been studied in the human embryo, first by M. Minkowski.[45] Movements may indeed be seen in the human embryo before any differentiation or function of the central nervous system; but these " idiomuscular " movements are slow, asymmetrical, arhythmical, amorphous and vermiform in nature. Only after passing through a stage of variability, irregularity and a tendency towards generalization, the function of the central

[44] Coghill, G. E.: *Anatomy and the Problem of Behaviour.* Cambridge: The Univ. Press, 1929. ——: The Structural Basis of the Integration of Behavior. *Proc. Nat. Acad. Sci.*, 16: 637-643, 1930. ——: The Neuro-embryologic Study of Behavior: Principles, Perspective and Aim. *Science*, 78: 131-138, 1933.

[45] Neurobiolog. Studien am menschlichen Foetus, in: *Handbuch der biolog. Arbeitsmethoden*, Abt. V. Teil 5B (1928); *Schweiz. med. Wschr.* 63 (1933); *Schweiz. Arch. Neur.* 27 (1931); *Encyclop. Franc.* 8 (1938); *Schweiz. Arch. Neur.* 45 (1945).

nervous system finally becomes established, though at first as a labile one. With increasing differentiation of the central nervous system motion becomes more and more individualized, thus, specialized. Refined and isolated movements are the end-results of this process.

Increasing specialisation was a basic element in H. Jackson's scheme of evolution of nervous function, conceived on *clinical* grounds and for clinical purposes. He defined increasing specialisation as a passage from the general or indefinite to the special or definite. Specialisation of movement is implied in terms such as *precision, delicacy, accuracy, discreteness*, and *refinement*, terms frequently used by modern writers. A localized type of response is proper to all of them. Their counter-part in sensation is epicritic sensibility (H. Head). The change in motion which marks the passage from forms still lacking a central nervous system to those endowed with it, marks also the passage from lower to higher levels, once a central nervous system forms. *That chapter of the natural history of motion which starts with the advent of the central nervous system, continues along the same principle with increasing differentiation of this organ.* There is no change in the *type* of evolution undergone by motion in the course of this history. Structure and function of the central nervous system are fundamentally the same at all levels. Clinging to " co-ordination " or " adjustment " as to the identical task of all levels of the central nervous system, Hughlings Jackson nevertheless admitted that in the lower centres there is a direct adjustment of few and simple movements to few and simple peripheral impressions, while in the very highest centers there is an adjustment of exceedingly special movements (representing movements of the whole organism) to the most special of impressions from the environment. In other words, if there is evolution, it goes on within the same " constitution," and it passes from the " simple " to the " special." Still more generally speaking, the Jacksonian evolutionary process is not endowed with that mysterious power of *creating* basically new types, it is only allowed to lead to a higher degree of specialisation of a pre-existing type. Subsequently, one will admit, that the higher levels evolved out of the lower ones.

The reverse of increasing specialisation is dissolution. Motion then re-assumes the more general or indefinite type. The wide-spread responses in the mass-reflex after complete and sudden transection of the spinal cord and the lack of the so-called discrete and skilled movements of the hemiplegic with preservation of the more generalized movements, are well-known examples of this return of the more special to the less special

type of motion in injury and disease. One might also mention H. Jackson's " reductions to more general adjustments " after epileptic attacks as signs of temporary dissolution. It is not necessary to interpret the passage from the indefinite to the definite as a passage from an early period of the natural history of motion to a recent one. Nor is it necessary to interpret the return to the more general type of motion in disease as a falling back to ancestral stages. In emergencies, such as injury, disease or experiment, the endangered organism and the reduced central nervous system retreat from the most special to the least special or more general, abandoning the *nervous* type of motion and saving the *vital* one. But it must be assumed that both types of motion live side by side in the same organism, each of them entering the stage whenever necessity arises. In speaking of motion as of a vital function finally turned over to the central nervous system but still represented universally in the rest of the body, I do not mean that the type of motion in its final shape as related to the central nervous system is represented in the rest of the body. This is not to be expected since the rest of the body is composed of parts having become organs too, i. e. differentiated instruments for the accomplishment of functions of their own, thus, having undergone in their turn change and refinement. What may still be represented universally, can only be the most general type of motion, common to animal life as such, at all its levels. This is what Glisson had in mind when speaking of contractibility as a general character of the living *fiber*. But this most general and universally represented motion may co-exist with Haller's irritability of the *muscles*, being in its turn motion at an advanced stage and related to a system of organs. Obviously the two physiologists spoke of two different things, and the famous dialectics comes to its end by doing justice to each type of motion in its own sphere. On the ground of the simultaneous presence of both types of motion in the same organism, one might expect specialized functions not to be the *exclusive* properties of the so-called higher species; nor the more general types of motion to be limited to lower species. In the so-called higher species, the specialized type of motion never severes its ties with the general type; the differentiation of the more special from the more general may therefore encounter greatest difficulties (Walshe).[46]

[46] In his critical analysis of voluntary movement (On the Notion of the " Discrete Movement ": A Critical Note. *Brain*, vol. 70, pp. 93-104, 1947) Walshe arrived at the conclusion that " discrete movement," believed to be innervated by the pyramidal system, is an abstraction, wide fields of neuro-muscular activity always being involved in apparently " separate " movements.

Resistance

The central nervous system can now be described as a complex of structures admitting of specialisation. This is the positive or the *facilitating* role of the nervous system. But levels or centers are also " positions of resistance." Bichat was the first to define life as a whole of resisting forces. Soemmering was the first neuro-anatomist to ascribe to the central structures a resisting power: he called this idea a " most daring assumption."

In his analysis of *atavism*, Virchow appealed to resistance as to an explanatory principle. Atavism is a most debatable concept which sprang from the theory of descent; this concept invaded also the doctrine of disease. As early as 1886 Rudolf Virchow warned against the misuse and misinterpretation of the term. He cited Charles Darwin's view, that there is a tendency in the young of each successive generation to produce the long-lost characters, and that this tendency, from unknown causes, sometimes prevails. Virchow also cited that other view of Darwin's that the characters appearing in regression, are omni-present in each generation, though only at a latent stage. Virchow related atavism to the spontaneity of the formative power (Blumenbach's nisus formativus). The latter, Virchow said, needs no external cause to come into being and action. On the contrary, it can only be prevented from constant action by external causes; as soon as these causes are eliminated, the now liberated formative instinct will re-appear. Thus, the new type reached by a given species appears to be forced upon the latter; it immediately yields to the ancient type when the force holding down the ancient type in favor of the recent one, is broken. Here then is a restricting and obstructing force, the action of which is indispensable for the formation of new structures. *Resistance is necessary for organogenesis.* Similarly, Soemmerring presumed that the formative power not only builds, trains and uses the cerebral organs as its appropriate instruments, but that this power also needs the resistance of these same structures for its own manifestations. At about the time Virchow made his profound remarks on " Descendence and Pathology," Hughlings Jackson outlined his scheme of evolution. There is a strong parallelism between Jackson's concept of the highest centres as the " least organized " ones and Virchow's view of the instability of recent types. But above all, Jackson made the idea of resistance an essential part of his doctrine of nervous function. Nervous discharges, the amounts and rates of these discharges and the degrees of resistance encountered by nerve impulses in cases of diseases of the nervous system, were the three con-

stituent elements of Jackson's abnormal physiology. No attention has been given so far to resistance as an essential factor in Jacksonian neurology. The resistance offered by the middle and lower centers to the periphery, thus, to the environment, is also expressed in terms of "protection." Thanks to this "protection," activities of the highest centers can go on uninterfered with by the environment and without producing reactions upon it; this is what Jackson called "internal evolution." The nervous arrangements of the highest centers are "left to fight it out among themselves"; new combinations arise. He called it "the effecting of the possible." Thus, evolution goes on and progress is achieved due to the resisting power of the central structures. Evolution marks the passage from the most to the least organized—"from centers easily transmitting accustomed stimuli and resisting novel stimuli, up to centers which have to be forced into activity." [47] But even the most fundamental task of the central nervous system, namely representation, was expressed by H. Jackson in terms of resistance. To say, he stated, that a part of the body is most specially represented in a centre, means that it is united by lines of least resistance to that centre, the parts less specially represented in it being united to it by lines of greater resistance.[48]

The doctrine of the resisting power of the central structures has still to be developed [49] and its usefulness for clinical purpose has still to be shown. H. Jackson used this doctrine to explain the distinction between petit-mal and grand seizures. While in the former the middle and lower levels

[47] *Selected Writings*, II, 81.

[48] Resistance must be distinguished from inhibition. Whereas by inhibition a given excitatory process is prevented by another one from displaying its full activity, by resistance the excitatory process is only prevented from reaching another region. Resistance is a barrier protecting a given territory from invasion by nervous impulses, inhibition is the keeping down of one nervous impulse by another. Inhibition leads to the concept of hierarchy by which the activity of one level is controlled by that of another one. This inhibitory power is conceived as a true activity of the controlling level. A resisting structure is conceived as more passive in itself: it is most fit to symbolize a true "physics" of the nervous system.

[49] What Hess in his *Die funktionelle Organisation des vegetativen Nervensystems* (Basel, 1948) called the invasion of adjacent central areas by nervous impulses encountering no opposition ("Ueberstrahlen"), or the expansive tendencies of uncontrolled irradiation, is, I believe, an experimental expression of resistance. He also called it a lack of delimitation ("Trennschaerfe") and explained it by lack of differentiation. Here, too, resistance is bound up with perfect organization (*l. c.*, pp. 194-5).

Two other contemporary neurophysiologists, Rosenblueth and Cannon admit of a "filtering" action (of the thalamus) limiting the number of afferent impulses reaching normally the cortex (Cortical Responses to Electric Stimulation, *A. J. Physiol.* 135: 690-741; 1942); this is another experimental expression of resistance.

resist the excessive discharge, this resistance is overcome in the latter; discharges can then spread and involve wide fields of motor end-organs. Recently, this writer [50] interpreted the hallucinations which might occur in patients suffering from lesions of the brain (regardless of their size and pathologic nature), as due to a break-down of the resistance offered by structures acting under normal conditions as screening mechanisms; they prevent superfluous and incompatible sensory impulses from reaching consciousness, thus, they prevent chaos and confusion and admit of a single and integrated world of sensory experiences. What follows is the first attempt to analyse the general services rendered by the doctrine of resistance for the interpretation of nervous function.

We are accustomed to look at the various "levels" of the central nervous systems as seats of positive events; we assign to them the power of producing *local* manifestations. Shortly, we make them workshops of nervous functions. The doctrine of resistance endows these levels only with the power of *restricting* temporarily or permanently physiological events believed to be the outcome of a much wider field of activity; the highest levels may be protected from the entire periphery, but the lower levels may also be protected from the discharges of the highest levels. According to this doctrine structures do not *promote*, they rather *limit* activities. The doctrine of resistance is of great help in checking the misuse of the theory of cerebral localization and the overgrowth of some of its concepts, such as "centers of activity."

The doctrine of resistance helps us to be constantly aware that the actual nervous processes are only the restricted results of much more diffuse and general happenings. In still more general terms it recalls to our insight that the actual nervous process is but a particular and restricted case of animal life as such. What may be resisted or what may be allowed to pass, varies from moment to moment; restriction is appearing, disappearing and reappearing according to conditions and needs. The very *dynamic* and *mobile* character of life and nervous function is stressed in this doctrine. The origin of specialized forms of life and nervous activity is not thrown into the past and thus made a closed and irrevocable chapter of a natural history which nevertheless remains a work of reconstruction of our own. The origin of new "species" of nervous function is rather conceived as a permanent state of becoming (creatio continua) by means of resistance; it springs from a soil the fertility of which seems inexhaustible.

[50] Gliome étendu aux lobes frontaux et pariétaux gauches—Hallucinations visuelles. Note, suivie d'un essai d'une théorie des hallucinations survenant chez des malades atteints de lésions du système nerveux central. *Revue Neurologique*, to be published.

To life is not denied its history, but we pass through the history of specialized forms of life and nervous function at any moment; in fact, we make this history over and over again.

Disease has always been conceived as a state of regression. It is one of the lasting results of the Jacksonian doctrine of dissolution to have shown that this regression leads back from the special to the general. While it is true that the experiences and the behavior of the diseased are foreign to those of the healthy, we should not ignore the *common* source of health and disease; all too frequently we experience that unpleasant gap which seems to isolate the healthy from the diseased. The contemporary attempts to relate the latter to the former by psychological means remains limited to the conscious sphere. Through a break-down of restricting structures in disease and injury the affected individual is led back to the immediate and direct sources of life which he shares with the healthy, and from which both draw their vital energies. *The state of health is a dynamic state of specialized vital manifestations which has to be maintained most actively and constantly with the instrumental help of structures resisting regression toward the more general. The assumption is made that the healthy lives a most precarious life under the permanent threat of overwhelming stimulations and constantly endangered to act and react by overflowing impulses; he has to resist both, stimulations and impulses, and this is the task proper of the central nervous system as an organ.* Disease produces indeed new forms of life inasmuch as positive symptoms appear for the first time in the life history; but these forms are at the same time the *potential* equipment of the healthy to which he goes back in emergencies.

SCURVY AT FORT ATKINSON, 1819-1820

WILLIAM J. REALS*

The United States of 1819 was still a sleeping giant. The Louisiana Purchase of 1803 had added vast new lands to the Union and had advanced the frontier across the Mississippi, but the new territory was largely unexplored. Traders from the fur companies in Spanish New Orleans and in St. Louis had traversed the great plains seeking commerce with the Indian tribes. In 1790 Morier had established trade with the Ponca Indians living along the Niobrara River in what is now northeastern Nebraska while agents of the Commercial Company reached the Mandan nation in 1796. English traders from Canada were also active at this time among the tribes living at the headwaters of the Mississippi Rivers, and the intrusion of the English indirectly brought about the dispatch of United States troops to the Council Bluffs on the upper Missouri River.

A study of the Mortality tables of the United States Army for the years 1819 to 1829 inclusive (Fig. 1) reveals 734 cases of scurvy for the

Years	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	1833	1834	1835	1836	1837	1838
Cases	7	734	86	4	29	—	8	4	2	8	6	16	3	7	5	15	9	17	59	159
Deaths	—	190	5	—	—	—	—	—	—	1	—	—	—	—	—	—	—	3	1	1

FIGURE 1

Incidence of scurvy among United States Army troops, 1819-1838. From *Statistical Report on the Sickness and Mortality of the Army of the United States*, by Thomas Lawton, Surgeon General, U. S. Army (1840), page 11.

year 1820 with 190 deaths. The Surgeon General's report (1840) remarks that the disease was relatively infrequent among Army personnel with the exception of the year in which the sharp rise is noted. Of the fatalities, 157 deaths occurred among the 788 officers and men of the

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Sixth U. S. Infantry Regiment who made the long upriver journey to defend the frontiers. Nearly all of the soldiers on the expedition fell ill of the disease during the first long winter the garrison spent in the wilderness outpost. The epidemic is among the last major outbreaks of scurvy to occur among United States soldiers.

The accounts of the outbreak of scurvy among the military personnel at Camp Council Bluffs or Fort Atkinson, as it was variously called, are to be found in three sources: the 1840 reports of the Surgeon General of the Army (1), the account of Samuel Forry in the *American Journal of the Medical Sciences* of 1842 (2), and in the regimental and company records of the Sixth Infantry Regiment (3). In more recent times Tyler (5), Levine (6), Long (7), and Crummer (8), have touched upon the epidemic. Forry's paper is largely a reprinting of the official reports of the regimental surgeons, Gale and Mower, to the Surgeon General. That phase of the epidemic contained in the company records has recently been made available through the courtesy of the Nebraska State Historical Society [1a] and together with Gale and Mower's letters are the best source of information.

Among the recommendations made by Capt. Meriwether and Lt. William Clark following their exploration of the Louisiana territory was one urging the establishment of a military work at the Council Bluffs on the Upper Missouri. The government, however, feared dilution of its population if emigration into the new areas became widespread and most of the recommendations and reports of Lewis and Clark were ignored for almost a generation by a nation which still largely resided east of the Alleghanies. It was not until 1818 that the Federal authorities became aroused over the in-roads of British fur traders in United States territory and decided to enforce the laws protecting the American fur trading interests by a show of force. Accordingly, Secretary of War Calhoun, on March 18, 1819, dispatched the Sixth U. S. Infantry Regiment under the command of Colonel H. Atkinson from Plattsburg, N. Y. to the Missouri.

The regiment arrived at St. Louis June 8th of the same year via the Ohio River and went into camp at Belle Fontaine, to equip and prepare for the next portion of the journey. The garrison had been stationed at Plattsburg for nearly three years, experiencing much of the "gay delight" of military life and none of its rigours. Surgeon Mower in his report

[1a] The Sixth Infantry records are here reproduced as they appear in the Nebraska Historical Society archives. Misspellings in some instances may have occurred when the copies were made in 1912 from the original company record books.

of the epidemic to the Surgeon General of the army stated that—" many foreigners had entered its (i. e. the 6th Regiment) ranks, who, from education and habits, were better fitted for the ordinary duties of a garrison than to undergo the laborious toils which awaited them." [1] Numbers of the men fell ill during the journey from New York; many from drinking the river water, others from sea-sickness and some in St. Louis, apparently more at home in the northern latitudes, were prostrated by the change in climate, which Mower characterized as " tropical." The food already at this early date was a problem for the commander for on August 26 the following order appears:

> Detacht Order.
>
> The board of Survey having inspected the Beef & Pork persuant to Detachment Order of this date are condemned. Eight hundred and ninety seven pounds of Pork and Two hundred and fifty four pounds of beef which on account of its remote situation from market cannot be desposed of at any price.[2]

On July 4, 1819 Col. Atkinson ordered the expedition to move upriver from the camp at Belle Fontaine, the troops to be distributed aboard the steam-boat " Thomas Jefferson " and four keel-boats together with their baggage, provisions, and camp followers. When about 300 miles above the starting point, St. Louis, the " Jefferson " failed, apparently due to mechanical difficulties, and the troops and the cargo had to be loaded onto the keel-boats which were propelled only by sails and by the efforts of the soldiers who poled the barges against the current. Mower states that " Without the experience of watermen, the troops had to contend with a torrent, which, in point of rapidity and natural obstructions is perhaps without parallel." [3] The struggles against the current at times compelled the troopers to plunge into the water to free the unwieldy boats from a sand bar or a snag, and during these operations much water was shipped, for the Surgeon General's report states that most of the flour and corn was damaged from frequent wetting during the river journey. The boats reached the camp site at intervals between October 3 and November 14, and the soldiers set up temporary shelter.

The journals of the Lewis and Clark expedition (4) describe the region

[1] Lawson, Thomas, *Statistical Report on the Sickness and Mortality in the Army of the United States*, 1840, page 14.

[2] *Fort Atkinson Records*, Vol. 1, page 71.

[3] Lawson, Thomas, *Statistical Report*, 1840, page 15.

where the fort was to be built; (Sergeant Ordway's account for July 30, 1804)

> we Set out very eairly this morning in order to find a good place to camp & wait for the Zotteaus Indians to come in C. we proceede on pass[d] where G. Drewyer camped last night . . . we proceeded on past a high bank & bottom Prarie arrived at high bluffs on S. S. we camped about 7 oClock close under the foot of bluffs in a strip of woods which make along under the Ridge to to River the Timber is copper nut white oak Black walnut elm bass wood or lynn hickery & C. below this handsome bottom prairie, above the timber and bluffs is a beautiful high prarie, I think it is the smoothest & prittyset place for a town I ever Saw. back of this high large prarie, their is uneven praries Some timber in the valies & on the branches & C. . . . This place is named Counsel Bluffs.[4]
>
> Lat. 41°, 17[m] 00 North.

Surgeon Gale in a medico-topographical report continued the description:

> The range of hills which, at unequal distances, every where bounds the Missouri, runs in upon the river about two miles below the cantonment, and breaks off perpendicularly at the water's brink. . . . It affords very sublime and picturesque views; and as a healthy situation, it is certainly unequalled by any other in the vicinity.[5]

Construction of barracks was begun at once. Considerable difficulty in building was experienced because of the greenness of water-soaked wood of the cotton-wood trees which lined the river bank and encircled the camp site. Shelter for the officers and men living in tents was badly needed for the temperature during October, November and December, 1819 varied from 88° to 10° below zero Fahrenheit. A killing frost was recorded on September 25, unseasonably early for the country. When construction was well under way, the post was officially established, as Camp Missouri:

[4] Not to be confused with the present day city of Council Bluffs, Iowa which is located on the east bank of the Missouri River. The site of the Council Bluffs and Ft. Atkinson is located in Washington County, Nebraska 15 miles up river from Omaha, Nebraska.

[5] Lawson, Thomas, *Statistical Report*, 1840, page 12.

Head Quarters, 9th Mil. Dept.,
Camp Missouri 2nd Nov. 1819.

Dept. Orders:

A military post is established at this place and is to be called and officially known, as soon as the barracks are erected, by the name of Cantonment Missouri. The Command of the post is confered to Lt. Col. Morgan, who will call on the Commandant of the Department for special instructions, relative to the duties of his Command.[6]

By December 20 the principal barracks buildings and hospital had been completed as well as the shops, armory and out-buildings. (Fig. 2.)

As early as October of the same year the length of the sick call list had noticeably increased and the commandant urged that the surgeons attend to the wants of the men:

Camp Missouri, October 13, 1819.

Regimental Orders:

In future the Surgeon will exhibit every morning to the Commandents of Comanies, a statement showing the names of the men on the sick report in Quarters who requires issues of fresh beef and it will in the future be the duty of the Commandants respectively to note in the margin of their Provisions return the quantity of fresh beef required.

The Commissary on receiving their reports will have them consollodated and issue the quantity required, conformably to the requisition to the Quarter Master Corporal of Companies. The increase of the sick report renders it imperiously incumbent on the Surgeon to visit the sick frequently during the day to attend to their wants, and report immediately any necessary which can be procured for their comfort or convenience in which it is confidently expected that the commandants of Companies will not decline any assistance which may be deemed requisit on their part.

(By Order)—Chas. Pentland, Ag't. R. R.[7]

Mower states that the men had been ill with dysentery and pulmonary infections, the latter being especially prevalent among those who had done the hardest labor in the construction of the post. Mower continues in his report: " Early in this month (January) a scorbutic taint was perceptible in some of our patients, who were laboring under other diseases. At first

[6] *Fort Atkinson Records*, Vol. 1, page 61.
[7] *Fort Atkinson Records*, Vol. 1, page 43.

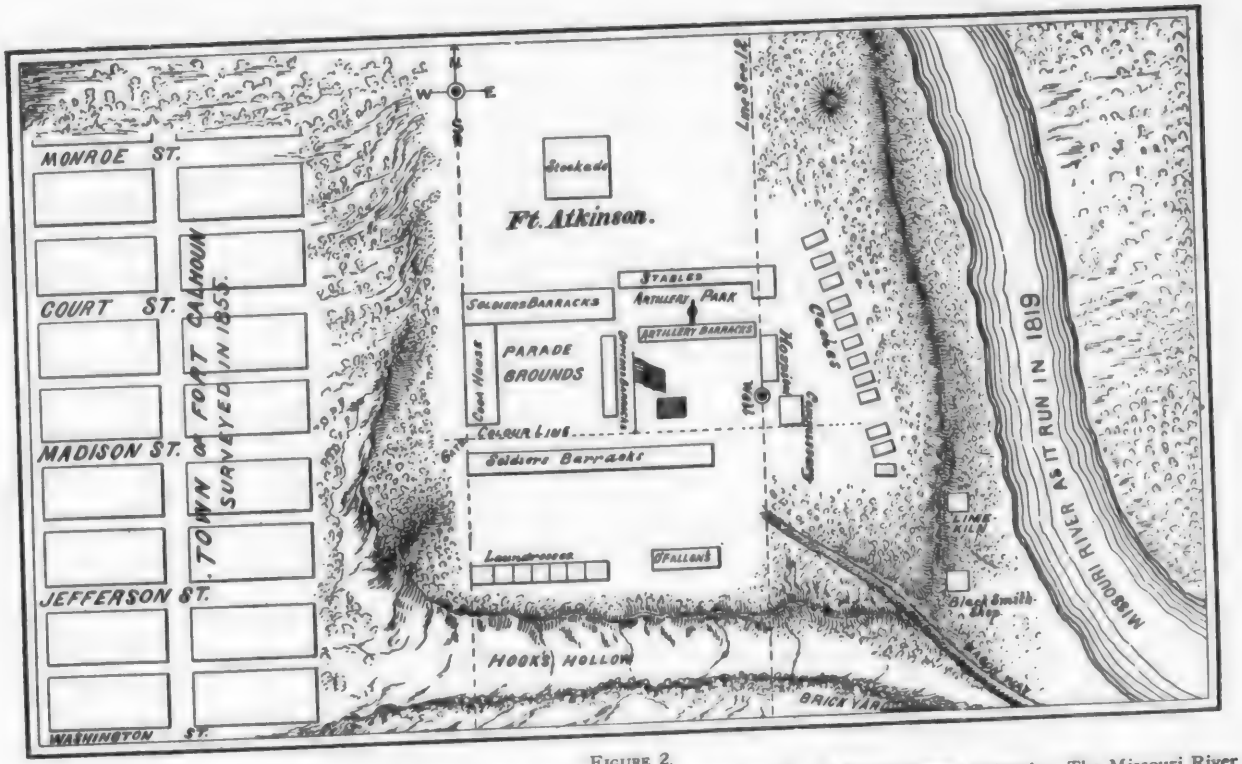

FIGURE 2.

Map of Fort Atkinson as it appeared in 1819 and its relation to the present day city of Fort Calhoun, Nebraska. The Missouri River channel has since shifted to the east. (*Courtesy of the Nebraska State Historical Society*)

the cases were mild, and appeared to yield, in some measure, to treatment. During the whole month, it was noticed that the recovery of our patients was peculiarly slow and precarious; in many cases, after the acuteness of disease had been subdued, the sufferer continued to languish and decline. Early in February the progress of scurvy had become alarming; its baneful influence was rapidly extending to every form of disease. The situation of the command had assumed a serious aspect. Most of the exciting causes still existed, while the means of relief were beyond our reach.." [8]

Terror began to walk the sentinel paths. The commander became visibly alarmed for his next order sets down detailed instructions to the officers and men:

Cantonment, Missouri
23 Jany 1820

Garrison Orders:

The Commandant had hoped when the troops had got in Quarters they would soon have been restored to health, but he observes with concern the sick list daily orgmence. At the present moment the sick must claim the first and chief attention of the commandants of Corps and yet it has not already been done, ample and comfortable Quarters must without dealy be provided for their reseption. —

Police tubs must be provided for the night. The Soldiers must resort to the Valts during the day and infraction of this order will meet with its proper punishment.

A Captain will be detailed weakly as officer of the Police he will be responsible that the parade and the environs of the Cantonment will be kept free from filth of every description.

He will visit the Quarters daily and occasionally during meal times. He will report when relieved in wrighting which will be spread upon the records of the Garrison and published in orders. The officer of the day is confined to his ordinary duties. The practice of throwing slops and filth near the gait ways, or near the Cantonment is forbidden for the future. These things must be carried a considerable distance from the Cantonment.[9]

Food, which in the early part of the expedition had been found to be unfit for issue now almost totally failed. Surgeon Mower's report continues: " The state of our subsistence stores had long been reviewed with concern. Fresh beef, which had been issued to the troops since their

[8] Lawson, Thomas, *Statistical Report*, 1840, page 17.
[9] *Fort Atkinson Records*, Vol. 1, page 117.

arrival, in the usual proportion, was in the latter part of January restricted to the use of a few hospital patients. The country was abounding in game, and the regiment having no expert hunters, little advantage was derived from the chase. The important articles of beans, peas, and vinegar, contemplated to have formed component parts of the ration, failed altogether. Salted pork and beef, bacon, flour, and Indian corn, constituted the substantial part of the ration. By far the greater part of the meat was decidedly in putrescent state, and absolutely unfit for issue; the smell and taste both rejected it with disgust. The flour, although less exceptionable than the meats, and originally of a fine quality, had become musty previously to its issue. The corn, which was furnished in the proportion of two pints to every six rations, was soon thrown aside as a drug. Deprived of vegetables and the usual condiments of the table, the repast of the soldier was, at the same time, deficient in nutriment, unpalatable, and unwholesome." [10]

Orders were issued concerning the distribution of food.

Cantonment Missouri Jany 26, 1820

Garrison Order.

The issue of Fresh Beef hereafter will be confined to the sick. It will be issued in equal quantities to the two corps at this place and will be distributed among the sick in such a manner as the Surgeons of Corps may direct.

(Signed) W. Morgan Lt. Colonel R. R. Comdg.[11]

Cantonment Missouri Feby 5, 1820.

Garrison Order.

The Commissary of Issues will issue the Corn Meal at this Post to the sick at the rate of a quart of corn meal to a ration of flour. Care must be taken that the meal be equally issued to the two Regiments. The Commissary will also issue the Vinegar at this Post provided the Surgeons should deem it beneficial to the sick.

(Signed) W. Morgan Lt. Col. R. R. Comdg.[12]

The following day, the surgeons officially reported to the commandant on the progress of the epidemic:

[10] Lawson, Thomas, *Statistical Report*, 1840, page 16.
[11] *Fort Atkinson Records*, Vol. 2, page 168.
[12] *Ibid.*, page 171.

Cantonment Missouri
6th Feby 1820

Sir,

In complyance with your order we have the honor to remark that the Scorbutic habit has assumed a distinguished rank among the numerous Diseases that afflict our camp independent of its own bain influence on the human System. It aggregates and renders more inveterate all the other diseases to which its unhappy Victim is liable it should therefore Guard against with the utmost precaution & every preventative that can Subject or experience dictate Should be used to put a period to its previlence and its influence.

It is a Disease Occuring after subsisting on Prutressent salted annable food with a deficiency of a vegitable matter, Excessive fatigue, indolence, cold and moister, and personal uncleanliness, may also be renumerated among its many exciting causes.

It is necessary that the men be compelled to air their beding frequently and change their flannel, often, washing their hands, face, feet and even their whole bodies previous to retiring to bead frequently in tipid warter wiping dry with a course cloth will be verry serviceable. The rooms should be kept perfectly clean with a free admission of Air. Guarding against cold and moisture with sufficient fires.

Salted provisions should be issued seldom as possible but fresh meat and such Farinacious subsistances can be procured, be substituted.

Vinagar the invaluable part of the ration has from necessity been withheld too much exertions cannot be used to remady this deficiency.

The Salted meat lately issued has been very prutessent and under present circumstances highly deleterious. By divesting it of its internal impuraties boiling it in changes of warter with the addition of Chair Coal it becomes much more palatable and holesome. We have the Honor Sir to be your Most Obt. Servt.

(Signed) T. G. Mower
Surgeon 6 Infty
Jno Gale Surgeon
Rifle Regt.

To Col. W. Morgan Commanding Brigade.[18]

[18] *Fort Atkinson Records*, Vol. 1, page 125.

The garrison Orders continued the account of progress of the disease:

Cantonment Missouri
Feby 15, 1820

The Surgeons having reported that fresh provisions are absolutely necessary for the health of the troops, and their being no other means of procuring it except by hunting, the commandants of corps will send out such parties as they shall deem necessary for this purpose. These parties may go beyond the limits prescribed by the Department Orders but in such case they must be accompanied by a Commissioned officer, and they must take the utmost care not to involve themselves in difficulties with the Indians. The Commandant must at the same time observe that nothing but absolute necessity would induce him to dispence with the orders of the Commandant of the Department, but the necessity of the case is so urgent that he feels no doubt but that the Commandant of the Department will approve the course he has adopted under the existing circumstances.[14]

In desperation, the commanding officer decided to send the most gravely ill men down-river to Fort Osage (near present day Kansas City, Missouri), hoping that better food and care might be found there.

Cantonment Missouri
March 6th 1820

Garrison Order.

Major Ketchum with a party of men has been detached for the purpose of bringing the boats to this place, in order to transport the sick to Fort Osage. It is hoped that these boats will arrive in a day or two, and that the weather will become sufficiently moderate to permitt the sick to embark. The commandant is alive to the situation of the sick. He has done all in his power to render their situation as compfortable as practicable. It is hoped, that at Fort Osage, they will be provided with every thing necessary to restore them to health. The Commandant has determined to send the sick below, without waiting the orders of the Commandant of the Department. The troops will see that the Commandant is not indifferent to their situation. There is no reason for dispondance. In a few days we may expect warm weather and in a very short time we shall be able to procure early vegitables.—In the mean time

[14] *Fort Atkinson Records*, Vol. 2, page 184.

the Commandant will confine their fatigues to indispensible objects. The Gates will be imediately erected and the guard reduced to the smallest possible number. The Commandant will see that all the soldiers unemployed will constantly be upon hunting excursions. The vigilance & activity of Officers is indispensably necessary.

Signed W. Morgan Lt. Co.[15]

Although the supplies were rapidly becoming exhausted, an increase in the corn ration was ordered hoping to stem the rapidly growing sick list.

Cantonment Missouri
March 10, 1820

Garrison Orders.

Instead of the quart of corn issued at present, in future half a gallon will be issued to the troops every six days. The Troops should pound the corn and make meal from it and hominy. And a additional quantity of corn may be issued to the sick if the Surgeon should deem it necessary.

(Signed) W. Morgan Lt. Col. R. R. Comdg.[16]

The bandsmen were sent to the companies in order that they might amuse the sick. In addition, card-playing hitherto forbidden was now allowed.

Cantonment Missouri
11 March 1820

Regimental Orders.

The Men composing the Band will go to duty in their respective companies until a favourable change in the health of the troops renders their services there unnecessary; an event which it is hoped is not very far distant. This measure is adopted as one demanded by extreme exigence as however, it is only to be considered temporary. The adjt will cause the uniform Clothing, Instruments, Tools, etc to be carefully packed and secured and held in readiness for delivery when called for hereafter. The Field Musicians also to be put to duty in their Companies until further orders subject however to such details only as appurtain to their grade as Musicians. The men of the Band are not to change their Quarters.

(Signed) G. Humphreys Major Comdg. 6th Infy.[17]

[15] *Fort Atkinson Records*, Vol. 2, page 200. [16] *Ibid.*, page 202. [17] *Ibid.*, page 203.

Cantonment Missouri
March 20, 1820

Garrison Orders.

Surgeons Mates Nicoll of the 6th Infy and Malone of the Riflemen will accompany the Invalids to Fort Osage Surgeons Mate Nicoll will have the superintendence of the whole; the Surgeons of the respective Regiments will see that their mates are furnished in the best manner possible.

By order of the Lt. Col. Comdg.

(Signed) C. Pentland Lt. Rifle Regt.[18]

The relaxation of the cardplaying ban soon had its repercussions.

Cantonment Missouri
21st March 1820

Garrison Order.

The order to allow the Soldiers to amuse themselves with cards whilst they are sick does not extend the same permission to officers nor will soldiers be allowed to play cards in their Quarters after 10 OClock. Commandants of Corps will addopt the most efficient means to enforce this order.

(Signed) W. Morgan Lt. Col. Rifle Regt. Comdg.[19]

Colonel Morgan published a garrison order in March seeking no doubt to buoy up the sagging morale at the little snow-swept outpost. The order reveals the Colonel to be the finest type of professional soldier, concerned first for the welfare of his men.

Cantonment Missouri
March 22, 1820

Garrison Order

The sudden and unexpected appearance of a desease at this place which has swept away so many valuable Soldiers, could not fail to excite in the bosom of the Commandant the most anxious solicitude the most poignant grief. The troops saw that every exertion was made by their officers to prevent the extantion of the disease, and to alleviate the suffering of those who have fallen under its influence; they therefore bore their suffering with a fortitude that re-

[18] *Ibid.*, page 213.

[19] *Ibid.*, page 213.

fleets honour on the American Soldiery, and which demands the thanks and respect of the commandant of the Post. Indeed its difficult situation which test the character not only of the soldiery but the spirit and firmness of the Officers, and their devotion to the service.

The Commandant firmly believes that the present mild weather which we have every reason to believe will continue will quickly stop the progress of the prevalent disease. The mild weather will no doubt soon bring forth the early wild vegetable which cannot fail to have the most salutary influence in preserving the health of the troops. It is confidently hoped that the hunters will soon find us a supply of fresh Buffalo meat, and sometime next month the commandant expects a drove of cattle at this place.

The Commandant therefore hopes the troops will not suffer themselves to be cast down; we could not guard against the disease with which we have been attacked because it was altogether unlooked for; henceforth we know our enemy and know therefore how to provide against him. Let none suppose because we have suffered the first winter after our arrival, we shall suffer in the same way in the ensuing winter. We shall hereafter be amply supplied with fresh provissions we shall be able during the summer to cut a sufficient quantity of hay to subsist all the cattle we shall require diring the winter, or if we cannot do this, the cattle can be killed early in the winter which slightly salted answers all the purposes of fresh provision. There are Soldiers at this Post who have subsisted chiefly on beef put up in this way at stations on the Mississippi in higher latitudes than that which we at present occupy, who have enjoyed perfect health and perhaps never have heard of the complaint which unfortunately exist at this place.

With respect to those troops who will probably ascend higher,[20] they will be in a Buffalo country, they will in all likelihood be furnished with horses and will be able to supply themselves amply with the meat of that animal. The past ought not to alarm us, because by making a proper use of the experience we have acquired we may easily avoid for the future the evils under which we at present suffer. Let none therefore be too soon disgusted with the service in which they are engaged. If the life of a soldier was always smooth and even he could acquire no reputation. It is difficulties

[20] The original plan of the War Department was to send scouting parties from Fort Missouri to the Columbia River!

and dangers that set him in a propper point of view and display his character to the best advantage. It is for Government to decide, it is ours to execute, nor can we be excused for decrying the service in which we are employed. It is not to be presumed that the Government will abandon their views on this river on account of the disease which has appeared at this place. They will judge properly, that it was mearly accidental, and one against which they may hereafter guard by judicious arrangements.

FIGURE 3.

The original company record books as they appeared in 1912 during the compiling of the *Fort Atkinson Records* from the Sixth United States Infantry Regimental records by the Nebraska State Historical Society.

(*Courtesy of the Nebraska State Historical Society*)

A portion of the sick will be sent down the river as soon as the boats can be prepared, for those who remain we have every thing to hope.

(Signed) W. Morgan Lt. Col. R. R. Comdg.[21]

Cantonment Missouri
April 4, 1820

Garrison Orders.

The Commandant has been appraised by the last communication received from the head quarters of the department, that a drove of

[21] *Fort Atkinson Records*, Vol. 2, page 221.

cattle has been purchased and will probably reach this place by the 20th of the present month, if not sooner. Boats laden with vegetables are also on the way, and will probably arrive about the same time; Every exertion has been used by the Commandant of the Department to have this Post supplied in the most ample manner at as a early a period possible. In the mean time let every attention be bestowed on the sick, let those who are able to walk be kept in the woods with their guns, let the strictest attention be paid to police of every description. This is a time which requires the most active and constant attention of officers. Let the orders heretofore issued be refered to, they must be enforced.—In a few days and our sufferings are at an end—the prospects of better days begin to dawn upon us—The Commandant calls upon the officers of his command intreats, he exhorts them to bestow unceasing attention upon every duty connected with their stations; in thus acting they will not only acquire the gratitude and respect of their Soldiers, but the approbation of their own consciences, and the applause of their country.

(Signed) W. Morgan Lt. Col. Rigle Regt. Comdg.[22]

Cantonment Missouri
5 April 1820

Regal Order.

Surgeon Mower will as soon as practicable designate to the commanding officer such invalids of the Regiment as he may deem it advisable to remove for a time to the woods for the benefit of their health; those men are to be placed under the command of Lieut. Durand who will as soon as they can be made ready conduct them out and locate them at such point or points as appears most (illegible), both as it regards wholesomeness of air, and ground for hunting; a sufficient number of rifles and other arms and a quantity of ammunition are to be taken a few days (say five of provisions, particularly and articles of bread and salt are also to be carried, Lieut. Durand will report to the Commandant for more particular instructions.

(Signed) G. Humphreys Major Comdg. 6th Infy.[23]

The little camp of invalids was soon named " Camp Recovery."

[22] *Ibid.*, page 230.

[23] *Ibid.*, page 231.

Cantonment Missouri
April 5th 1820

Garrison Orders.

The Sick who are permitted to go out hunting will be supplied with powder and lead—Muskets too will be furnished when required—Special care will be taken that the amunition is not wasted.

(Signed) W. Morgan Lt. Col.
Riflle Rget. Comdg.[24]

Cantonment Missouri
April 6th 1820

Garrison Order.

The Commandant has the satisfaction to announce to the command the progress of the sick sent to Fort Osage; They were on the 28th Ultimo 90 miles below this place, and had only lost three men, two from the Rifle Regiment, and one from the 6th Infy, the others where part recovering and where in high spirits.

By order of the Lieut. Colonel Commanding.

(Signed) C. Pentland Lt. R. Regt.[25]

By April 8th the epidemic apparently had run the course for the ban against card playing again appears in the orders.

Cantonment Missouri
April 8th, 1820.

Garrison Orders.

The Commandant once more announces his determination to carry rigidly into effect the orders heretofore issued against a certain discription of games prohibited within a certain distance of a military post by order emanating from the War Department.

The Soldiers are allowed to amuse themselves with cards until the health of the command be restored, and the same indulgences would be extended to Officers under the circumstances in which we are placed, if card playing could be confined to amusement alone but is liable to be carried to a pernicious excess. The prohibition will therefore hereafter be strictly enforced without respect to person.

(Signed) W. Morgan Lt. Col. Rifle Regt. Comdg.[26]

[24] *Ibid.*, page 234. [25] *Ibid.*, page 237. [26] *Ibid.*, page 237.

Cantonment Missouri
April 29, 1820

After Order.

Lieut. Palmer as Seigior officer at Camp Recovery will take charge of the men at that place; those employed in fencing and aranging the garden and field there, are to be under his direction.—In future untill further orders, he will draw upon the Commissary for Rations for the men of his party, and they are to be excluded from the requisitions of their respective companies. In the next Muster Rolls and Returns, the men have alluded to are to be reported present.

(Signed) G. Humphreys Major Comdg. 6th Infy.[27]

No further references to the scurvy epidemic appear in the regimental records. Fresh provisions and the coming of spring soon brought health to the invalids quickly emptying the hospital and "Camp Recovery." As new troops arrived and the camp enlarged the horrors of the epidemic were forgotten in the busy routine of frontier life.

By 1827 the Fort had fulfilled its usefulness. American interests were firmly established in the Missouri Valley and Fort Atkinson, as it was by then called, was abandoned, the troopers going down-river to Fort Leavenworth (Kansas). The Camp site quickly returned to the wilderness deserted by the fickle Missouri which has long since changed its channel some miles to the east.

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THE HISTORY OF GOITER IN AFRICA

ISIDOR GREENWALD*

Introduction

The author has previously reviewed the history of goiter in the Americas, in New Zealand and in England. The present paper is a continuation of a general survey of the history of goiter, and deals with a fourth geographical unit, for a part of which we have historical knowledge for a longer period than is the case with those regions previously studied. For much of the continent, however, the records do not reach so far back. Nevertheless they appear to be sufficient to support the view that goiter is an epidemic disease, introduced into most of Africa in the nineteenth, or even the twentieth century.[1]

There are several instances in which we can fix the first appearance of goiter to within a very short period, from two to ten years.

Early Reports

There are a few localities in which goiter was encountered when the district was first visited, or described by white men. Only one of these much antedates the nineteenth century.

Goiter was reported by Leo Africanus as occurring in the Rif country of northern Morocco in 1510. Of this region he wrote: "in fine, tutti gli huomini di questo monte ánno nela gola quei gossi, che si veggono allevolte ad alcuni, & sono egualmente bruttisimi e ignorantissimi" (a p. 54).

It is noteworthy that, although Leo travelled through almost the entire length of North Africa, penetrating well into the mountains and crossing the Sahara from Morocco to Timbuctu and Lake Chad (see maps in Leo Africanus b) and discussed "What kinds of diseases the Africans are

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[1] It is impossible to list all the publications that have been consulted. For the most part, reference is made to travellers who did not mention the existence of goiter, only if, because of their training as physicians or because of the manner in which they recorded the presence of other diseases or the physical appearance of the natives, they might have been expected to have reported the endemic occurrence of goiters, if they had seen them. Reports concerning districts from which goiter seems never to have been reported are not mentioned, nor are those of very early travellers, who do not mention the absence of goiter, if later ones are available.

subject to" (b), the only reference to goiter is the one cited, which, incidentally, is to its occurrence in a region that he, himself, did not visit.

Some sixty years after Leo, Marmol Caravial (1573) gave much the same localization of goiter and ascribed the disorder to the use of cold water. "Es tanta la frialdad destres sierras, que se hazen a los hombres y alas mugeres unos papos en los gargantas muy grandes, y dizen que es del agua fria que beuch."

That the Mediterranean littoral and the immediate hinterland were free from goiter during a great part of the Roman occupation may be inferred from the fact that its existence there was not mentioned by Pliny and that neither St. Cyprian (d. 258) nor St. Augustine (d. 430) seem to have mentioned it, although both the latter referred to a considerable number of diseases and deformities (Sullivan, Getty).

Libya: Cyrenaica and Tripoli

So far as the literature examined discloses, goiter has never been reported from North Africa between the Egyptian border and Tunis.

Algeria and Tunis

For Algeria, we have numerous accounts by military surgeons and others. The earliest medical reports of any kind that I have found date from 1830. In 1833 there appeared a 104 page "Essai topographique et médicale sur la régence de Alger" (Fouqueron), which included a description of the women of the country and had 16 pages devoted to medicine. There was no mention of goiter. The earliest reference to this disease was given by Guyon (a) who said that Baudoin had seen it in several places in the Little Atlas between 1832 and 1836. In 1840, Guyon (b) reported that "une des soeurs de charité" had told him of several cases of goiter at Constantine, in people coming from the mountains.

In 1842 Bertherand reported goiter as endemic in Blidah (a few miles southwest of Algiers) and said that he had seen two or three cretins. In his report for Blidah in 1842, Finot wrote: "J'ai vu quelques femmes arabes, originaires de tribus de l'Atlas, atteintes de goitre." Thereafter, there were many other reports: Bertherand (1854-7), Vedrenne (1859), Challan (1868), Hanoteau and Latourneaux (1893), and Sergent (1912, 1916). The last reference is the earliest to the occurrence of goiter in the more western part of Algeria, between Oran and the Moroccan border. In 1897 de La Martinière and La Croix had discussed the diseases of this

region but did not mention goiter. It is therefore not unreasonable to assume that the disease first appeared after that date.

Morocco

Apparently the only European visitor to the Rif until late in the nineteenth century, who has left us any account of the country, was Fréjus, who crossed it in 1666. He did not mention seeing any goiters.

Since about 1885 the region has been the scene of considerable investigation by explorers and anthropologists, none of whom seems to have reported the presence of goiter. It was not mentioned by de La Martinière and Lacroix in the 106 pages they devoted to the Rif in 1897. Nor is there any reference to it in the book by Coon (a), who further informed me: "My measurement blanks show not a single instance of goiter in over 1100 individuals who represent samples of every tribe in northern Morocco" (b). Further evidence that the disease was until very recently infrequent in Spanish Morocco is to be found in the fact that Bravo (1932) did not mention it in the forty pages he devoted to the diseases of that region, of which he listed twenty-nine. However by 1945 the disease had crossed the border and a few cases were reported from a district just north of the border of French Morocco (Amaro) and in 1947 Many wrote that he had seen several cases in Tangier (infra).

Nor was goiter reported from any other part of Morocco until quite recently. I have found no mention of it in any of the reports of travellers during the eighteenth and nineteenth centuries. One of these travellers, Lempriere (1794) was a surgeon, and in his book mentioned several diseases, but not goiter. Two, Buffa (1810) and Rohlfs (1874), were physicians and both discussed the diseases they encountered. This was also done by a layman, Jackson (1809), who had spent 16 years in Morocco. Jackson remarked on the beauty of the women of Fez and Meknes. Another physician, Leared, visited Fez in 1877 but apparently made no observations regarding the diseases of the country. Even in the early years of the present century goiter was not mentioned in the 22 pages of Meakin (1902), the 203 pages of Raynaud (1902), the 11 pages of Vincent (1904) nor the 20 pages of Kerr (1912), all devoted to the diseases and medicine of Morocco. Nor did Chatinières, a physician engaged in the Moroccan medical service from 1912 to 1916, make any mention of goiter in his book.

However, since about 1920, goiter has been quite common around Fez and not infrequent in other parts of Morocco (Dekester and Martin, Dubois-Roquebert).

Dr. M. Many of Tangier informs me that "Goitre is a fairly common disease in Morocco—I have myself had several cases in Tangier." Most interesting is his statement "in the town of Sefrou, some 30 miles south of Fez, nearly every woman is affected with goiter." This is a very old town of several thousand inhabitants and was mentioned by a large number of writers from El-Bekir in the eleventh century and Edrissi in the twelfth down to the present day. Leo Africanus gave it sixteen lines, including: "There is no memorable thing in all this town" (b). As late as 1931 Benoit wrote: "Au reste, à Sefrou, toute la vie se concentre dans le mellah, sur le bord de l'oued, grouillant de belles juives – – –" (p. 134).

It is also interesting to note that none of the 51 cases of goiter reported by Dekester and Martin in the district of Fez in 1922 and 1923 came from Sefrou, only thirty miles from the city.

It is impossible to avoid the conclusion that the general occurrence of goiter in Morocco is very recent, even though there seems to have been a focus of the disease in the Rif in the sixteenth century.

Upper Niger (French West Africa)

A second instance of the presence of goiter in Africa at a time when the district first became known to Europeans is to be found in the report by Mungo Park of goiter among the Mandingoes in Bambara, on the upper Niger, in 1795. Some 25 years later goiter was again reported from this region by Mollien (p. 242) and by Caillié (vol. 1, p. 279). These travellers seem to have observed goiter higher up on the Niger than did Park, and in fact seem to have encountered some on the watershed between the Gambia and the Niger. This is particularly interesting because Moore reported seeing "King's Evil" on the upper Gambia between 1730 and 1735. If this were goiter, and not scrofula,[2] Moore's account would antedate that of Park by sixty years and would indicate the possibility that the disease was, in fact, introduced by Europeans visiting the west coast (see next section).

However that may be, goiter was again reported about where it was seen by Park, by Quintin, who remarked on the absence of cretinism, in 1864. What Anderson saw among the western Mandingoes, on a tributary of the upper Niger, in 1864, and described as similar to "King's Evil" was almost certainly goiter (see below, p. 160).

There is no early report of the existence of goiter along the Niger

[2] There was considerable confusion between the two at that time.

below the great bend of the river. However, it was present in the semi-circular territory immediately to the south of this bend some time before 1907 (Desplagnes).

West Coast

(Senegal, Gambia, French Guinea, Sierra Leone, Liberia, Ivory Coast, Gold Coast, Togoland, Dahomey).

Beginning in the fifteenth century European navigators made their way along the west coast of Africa. They left us a large number of descriptions, more or less detailed, of the inhabitants of the coast and the adjacent country. I have found no mention of goiter in any of the early reports.

Even at a much later date there seems to be no mention of the presence of goiter in Senegal (Berville 1857; Chassaniol 1865; Borius 1880-1882).

In Gambia, goiter, or scrofula, was present in 1730-1735 (see p. 158). However, goiter seems to have been absent in 1818 to 1821 (Gray and Dochard) and in 1830 (Boyle). In fact Gray remarked on the beautiful figures of the women. By 1866 the disease was established. ' This disease is noticed in the swampy island of M'Carthy's several miles inland of the river Gambia " (Horton, p. 245).

In French Guinea goiter was listed as among the more common diseases by Madrolle in 1895, but it is not clear whether this was along the coastal streams or on the other side of the watershed, on the headwaters of the Niger.

Further along the coast is Sierra Leone. Winterbottom has left us *An Account of the Native Africans in the Neighborhood of Sierra Leone* the second volume of which is devoted to " An Account of the Present State of Medicine among the Natives of Sierra Leone." I have found no mention of goiter. In the first volume under the heading " Persons of the Natives " we may read: " The natives of Guinea are in general described by travellers as well formed in their limbs, and remarkably free from natural deformity. . . ." (p. 180)

" The young women are in general remarkable for the beautiful contour of their limbs, and for an ingenuous open countenance. Their necks and brows are well-turned, scarcely indeed to be surpassed by the bending statue which enchants the world." (p. 181)

About twenty years later Laing travelled from the coast to the extreme north of the present territory of Sierra Leone, probably into what is now French Guinea. He mentioned seeing several diseases but did not include goiter. That the disease was not present even at later dates may be

inferred from the failure of Boyle (1830) of Horton (1866), who was a native of Sierra Leone and who did report it from M'Carthy's island in the Gambia (see above, p. 159), and of Borius (1880) to mention the condition. In 1895 Mary Kingsley remarked on the comeliness of the women of Sierra Leone and wrote twelve pages on the diseases of West Africa (Sierra Leone to south of the Equator) without mentioning goiter. As late as 1908 goiter was not included among the diseases reported as encountered among the more than 3250 persons treated at the medical mission at Rotifunk, near Mokene, on the Bumpwe River, between January 1907 and April 1908 (Alldridge).

Nevertheless by 1924 goiter was very common among certain tribes (Blacklock a, b) and the annual reports of the Medical and Sanitary Services for 1936 and 1937 (Sierra Leone) listed several cases of exophthalmic goiter and "other diseases of the thyroid." Later reports did not distinguish between goiter and other endocrine disturbances.

Next to Sierra Leone is the Republic of Liberia. In 1850 Lugenbeel, "late Colonial Physician and U. S. Agent," published an "Account of the Geography, Climate, Productions and Diseases of the Republic of Liberia." He listed some 17 diseases, but not goiter. In 1868 Anderson, a native of Liberia, travelled to Musurdu, 8° 27′ 11″ N and 8° 24′ 30″ W (see above, p. 158). There he saw "a disease which sometimes attacks individuals in a peculiar way; it is an affection of the throat, causing a protuberance almost similar to what is called the 'King's Evil.'" (p. 91) This was probably goiter and the context makes it quite clear that Anderson was unacquainted with the condition and that he had not seen it in his own country.

An expedition under the auspices of Harvard University was sent to Liberia in 1926-7. The report edited by Richard P. Strong contains no mention of goiter. Neither do the 22 pages devoted to "leechery" in Schwab's book, describing conditions in 1928. Less than ten years later, it was very frequent (Anigstein).

Adjoining Liberia is the French Ivory Coast. I have found no early references of value, but by 1901 the natives of the western part of the colony had a word for goiter (Delafosse).

Further to the east, along the Gold Coast, the disease seems to have existed for a long time. A list of "the various diseases which prevail on the Gold Coast" was given by Reynhaut, "physician to the Dutch forces for five years," to Hutton and is reproduced in the latter's book (p. 386). Included are "Strumae" and "Branchosele" (sic). In the interior around Coomassi, or Kumasi, in the Ashantee country, about

120 miles from the coast, many cases of goiter were seen in 1817 (Bowdich).

Many years later (1909) German physicians at Lome, in the neighboring Togoland, operated upon persons with goiter coming from the Gold Coast (Reichskolonialamt, *Medizinalberichte*, 1909-10.) In 1919 Masters reported that "Adenomata of the thyroid and diffuse enlargement of the gland itself are fairly common" at Prestea, about 40 miles from the coast.

The earliest reference to the occurrence of goiter in Togoland itself that I have found dates from 1893, when it was observed in the extreme northern portion, in what is now part of French West Africa (Doering). Subsequent Mitteilungen aus den deutschen Schutzgebieten as late as that of 1902-03 contain no further references to the occurrence of goiter. By 1909 the disorder seems to have been quite widely distributed (Reichskolonialamt, 1909-10; Meyer) and in 1918 Calvert wrote: "Goiter is prevalent throughout the country." (p. 70)

The neighboring country of Dahomey has had a great interest for travellers, explorers and ethnologists. Duncan discussed the diseases prevalent at two places on his route from the coast to the Niger (1845-6) but did not mention goiter. Some years later (1864) Barton (a) visited Dahomey. He did not mention seeing goiter and the omission is significant for he had only recently remarked on its absence in Utah (b) where, according to ideas prevalent at the time, it should have been present, and he was only a few years later to report on its presence in Brazil (c). By 1894 goiter was fairly common in certain parts of the country. Cretinism was very rare (Foa).

Nigeria

In 1830, there was an expedition to explore the course of the Niger. This party reached Sokoto (13° 9′ N), in what is now northern Nigeria. An entry in the journal (Lander), written near Busa (10° 12′ N) reads: "The natives are subject to very few diseases." Several are mentioned but goiter is not among them.

In 1841 and 1842, there was another expedition. The senior Medical Officer, McWilliam, has left us an account of the natives seen along the banks as far as the confluence of the Niger and the Tchad, now called the Benue. He did not mention seeing any goiters. Another account of the same expedition by Allen and Thomson (a physician) is similarly silent. A few years later, Daniell published his *Sketches of the Medical Topog-*

raphy and Native Diseases of the Gulf of Guinea, Western Africa. The districts included the shores of the Bight of Benim and the Bight of Biafra. The only mention of goiter that I have found is the following (page 114): "Cretinism, or goitre, does not appear to exist in this river [3] nor indeed in any of the lowland countries of the delta,[4] nor are the natives in general liable to this peculiar morbid affection. Bronchocele may be observed at intervals in some of the younger females, but, according to the assertions of the country practitioners, it is seldom of long duration, disappearing as they advance in age."

Whether or not the "bronchocele" was merely a pubertal enlargement of the thyroid or was really a mild goiter (if, indeed, there be a difference) cannot be determined.

However, from at least 1918 the *Medical and Sanitary Reports* (Nigeria) mentioned the occurrence of exophthalmic goiter and of other diseases of the thyroid among the natives. In 1926 there were 17 thyroidectomies and in his report for that year Braithwaite discussed "Goitre in African Natives." The discussion was based upon his experience at the hospital at Warri, where there were 8 cases of goiter.

Braithwaite mentioned the lack of cretinism which has also been remarked by others who have observed goiter in West Africa. Braithwaite ascribed this "to the fact that abnormal children in Nigeria do not receive the care which insures their survival." However, the photographs reproduced in another part of this report and in that of the following year show a considerable number of congenital abnormalities in children who had been permitted to survive.

The reports for the years 1927 to 1934 show an increasing number of patients treated for goiter and that for the latter year states that 60% of the women of one tribe had goiter. The report for 1935 lists a somewhat smaller number, those for 1936, 1937 and 1938 are not available to me, and those for 1939-1946 do not list goiter separately, but only as disorders of "endocrine glands and general." In 1936 the Economic Advisory Council made a survey of nutrition in the British Empire and for Nigeria it is stated "There is a patchy distribution of goiter especially among women in whom the incidence may be as high as 60%." [5]

In the annual reports of the medical services of Nigeria for 1942, 1943

[3] Callebar.

[4] Apparently that of the Niger is meant.

[5] The same report (page 114) states of Tonga "there is a certain amount of goitre which points to iodine deficiency." *This among a people whose diet consists largely of fish and in an island whose total area is 250 square miles!*

and 1944 there are several references, not to a " patchy distribution " but to the general occurrence of goiter in several provinces of Nigeria.

Of particular interest is its great prevalence in Bornu. This region and what are now the neighboring northern provinces of Nigeria, were explored by Denham, Clapperton and Oudney in 1822, 1823 and 1824 and by Barth from 1849 to 1855. I have examined their reports without finding any mention of goiter. It is true that in his *Collection of Vocabularies of Central African Languages*, Barth lists a Hausa and a Fulfulde word for goiter. However both these languages are, and were, widely spoken and Barth penetrated as far west as Timbuctoo, traversing the territory from which goiter was later to be reported by Desplagnes (page 159) and coming quite close to the goiter district on the upper Niger discovered by Park in 1795 (page 158). Certainly wherever it was that Barth saw goiter it is impossible to read his account and not be convinced that if goiter had been *endemic* in any region that he visited, he would have mentioned it.

Moreover Nachtigall, a physician, who about 1870 explored that part of Africa and spent at least six months at Kuka or Kukawa, the chief city of Bornu, devoted 29 pages of his book to " Klima und Krankheiten in Bornu " without mentioning goiter.

Even much later Schultze, who was there in 1903 and 1904, mentioned the prevalence of several other diseases but wrote nothing about goiter.

Another great endemic center in 1942 was Benue province. A great part of this region was traversed by Maistre in 1893. In his account there are numerous references to the physique of the natives but the only diseases mentioned are fevers and smallpox. The Benue River at Ibi, Jebn and Iola (or Yola) was reached by Zintgraff in 1899 and 1900. There is no mention of goiter in his report of his travels. This district was also traversed by Alexander in 1904 (a) and 1909 (b). His accounts pay tribute to the fine physique of the women but say nothing about goiter. Nor was this disease mentioned by Tremearne as late as 1912.

It is quite evident that the endemicity of goiter in Nigeria is a very recent phenomenon.

Cameroons

The neighboring Cameroons were visited by Burton (d) in 1863. There is no mention of goiter in his book. As late as 1898 Plehn wrote of the coastal regions (page 271): " Kretinismus, wie Kropf, scheinen vollkommen zu fehlen." Even further inland in the mountainous region between the then German and the English possessions and stretching all

the way to the Benue River at Iola, there seems to have been no goiter (Zintgraff 1899-90; Huttner, 1891-93).

However, by 1906 goiter was reported from some of the foothills further north in German territory, with an express statement that it was not present in the more mountainous regions (Glauning). Noteworthy is the presence of cretinism in the Didan Mountains. A few years later it was reported from several places, some of them at no great distance from the coast (Preil: Reichskolonialamt, *Medizinalberichte* 1908-09, page 209; 1909-10, pages 360-361: Külz, 1910, p. 30).

One of the places mentioned by Külz as a goiter center was Jaunde, or Yaoundé, (3° 50″ N and 11° 40″ E). It is therefore noteworthy that von Carnap, head of the station at Jaunde, had not mentioned goiter among the diseases prevalent there in 1895 to 1896. Nor have I found any reference to goiter anywhere in the Cameroons in any of the Mitteilungen aus den deutschen Schutzgebieten from 1897 to 1903 or in the *Medizinalberichte über deutsche Schutzgebiete* for 1904 to that for 1907-1908, when one native was treated for goiter at the hospital at Duala. Specific reports for Jaunde are found in the *Medizinalberichte* for 1907-08 and 1908-09 but there is no mention of goiter.

It would seem that goiter first appeared in the Cameroons about forty years ago.

French Equatorial Africa

This territory extends for nearly two thousand miles from north to south. The northern portion, as well as a large part of adjoining French West Africa, and including the region around Lake Chad, was explored by Barth between 1849 and 1855 and again by Nachtigall some twenty years later. Neither mentioned the existence of goiter, although the latter devoted considerable space to a discussion of the diseases of the natives. In 1922 Moineau reported on the diseases seen on his journey eastward from Lake Chad and Fort Lamy, some sixty miles to the southwest, to the borders of the Egyptian Sudan. He wrote: " Je n'ai vu des goîtres dans les régions que j'ai visitées " (p. 78).

Further south, to the west of Fort Archambault, the disease was endemic by 1914 (Bouillez-a). Apparently it was of quite recent appearance in most, if not all, of the region. Bouillez wrote (b-p. 165): " Cette affection, d'après les indigènes, serait en extension. Originaire de la région de Goundi, elle aurait gagné un grand nombre de villages, surtout depuis le passage de Rabah, c'est à dire depuis une vingtaine d'années.

" Les indigènes paraissent lui reconnaître une origine infectueuse; port

d'un objet précédemment en possession d'un goitreux ou absorption d'eau contaminée par lui." (p. 165)

This native account is substantiated by the failure of Maistre to mention the existence of goiter in 1892 and the similar omission by Alexander (b) in 1905, although both seem to have passed through what was, in 1914, a goiter region. The territory in which the disease was present does not seem to have increased to any considerable extent between 1916 and 1921 (Muraz, a, b). In one part of this district, of 400 men called as recruits in 1938, 300 had goiters (Dupont).

For the southwestern corner of French Equatorial Africa, along the coast from Portuguese territory to the Kuilu river (4° 30′ S) and from the valley of this river to about 3° 50′ S and 12° 15′ E, we have the definite statement, as regards the situation in 1873 to 1876: "Kropfbildung überhaupt nicht beobachtet" (Güssfeldt, Falkenstein and Pechuël-Loeschke, Part III b, page 21). No subsequent reports have been found.

Belgian Congo

South and east of French Equatorial Africa is the Belgian Congo. The river from which this territory takes its name was entered by Europeans in the fifteenth century. Since that time it has been of great interest. There were many explorers and travellers into the countries near the mouth of the river who have left us more or less detailed accounts of the natives but the earliest report concerning the diseases that I have found is that of a Dr. Smith who in 1816, accompanied an expedition that penetrated about as far as the present Leopoldville. His account, to be found in Tuckey's book (p. 383), reads: "The natives in general appeared healthy, the diseases under which they mostly labored were of the cutaneous kind: few being free from the itch and scrofula; leprosy and elphantiasis were observed, and some few cases of fever and fluxes occurred. They appear also to be subject to indolent tumors and many of them were observed to have large navels."

It is possible, though unlikely, that the "scrofula" and "indolent tumors" included goiter. By that time the difference between scrofula and goiter was fairly well understood.

An early reference to the presence of goiter in the basin of the Congo [6] is the statement by Cameron (1877, vol. 2, p. 314): "The people here [7] are greatly affected with goitre and strangers residing among them are

[6] Livingstone seems to have seen goiter along one of the tributaries of the Lualaba in 1870 (see page 170).

[7] This refers to the headwaters of the Lualaba, the chief affluent of the Congo.

said to feel symptoms of that disease after drinking the water for a few days." Cameron did not visit this region himself but repeated the reports of natives. His own route led him from about the present Albertville on Lake Tanganyika northwest to the Lualaba-Congo at Nyangwe (4° 15′ S). From there he proceeded southward largely along the Lomami River to about 8° S and 16° E and then southwest across and along various tributaries of the Congo and Cuanza to 11° 30′ S and 21° E and finally westward to the coast at Benguela, crossing the highlands of Bihé. His book is indexed, but the only reference to goiter is the one already cited and a page by page examination disclosed no other.

One of the great explorers of the Congo was Henry M. Stanley (1874-1888). Examination of his published works has disclosed no reference to goiter. However Thomas H. Parke, medical officer of the expedition for the relief of Emin Pasha kept and published a diary. In that we find (p. 259) that on August 19, 1888, at Fort Bodo, in the foothills on the western side of the watershed between the Congo and Lake Albert, Parke included a case of "struma" in his "Complete List of the Sick in Camp." This was among the members of the expedition, nine-tenths of whom came from Zanzibar. There was no mention of goiter or struma among the natives. In fact the Manguema women along the Aruwimi River were said to be "extremely handsome" (page 343) and "undeniably handsome" (page 463).

That goiter was known as early as 1887 near the mouth of the Congo is evidenced by the presence of the word in a dictionary published in that year (Bentley) and confirmed for a later date by its mention in a book by Weeks (1914) that deals with the regions adjacent to the lower Congo, near its mouth.

However, the latter author did not, in 1913, include goiter among the more than forty diseases for which the natives had names in a district further up the river, apparently about 60 miles below New Antwerp. On the other hand, Whitehead, in 1899, listed two words for goiter in the Bohangi language, spoken by some of the natives of the Congo from below the mouth of the Kasai to Irebu, but also along the Mobange or Ubangi River, which for several hundred miles forms the boundary between the Belgian Congo and French Equatorial Africa. It was on one of the streams emptying into the Ubangi from the *west* and hence in French Equatorial Africa, that Ringenbach and Guyomarch found twelve cases of goiter in 1912-13. Except for two cases seen in the coastal province of Gabon these seem to have been the only goiters seen by them

in their long travels to fix the border between French Equatorial Africa and the Cameroons.

Further up, the Ubangi receives the Uelle, or Uele, from the *east*, and on some of the tributaries of this stream Rodhain at about the same time (1914) observed goiter in truly endemic proportions, half of the women in two villages being affected. Since that time this district has become a great goiter center.[8]

It is interesting to read some of their comments on the history of the disease in the Belgian Congo:

> D'après les indigènes, la maladie serait d'introduction assez récente: celle-ci remonterait d'après eux une quarantaine d'années. Ces affirmations d'indigènes, assez sujettes à caution en général, sont en fait confirmées par les observations médicales.
>
> Je me permets de donner à ce propos quelques renseignements personnels.
>
> J'ai rayonné de 1890 à 1893 dans les territoires situées au Sud et a l'Ouest de Bondo (rivière Likati et sources de l'Ebola). En 1894, j'ai voyagé pendant des semaines dans les secteurs des rivières Ebola et Dura, et durant les 3 années subséquentes j'ai fréquemment eu à examiner à Nouvelle-Anvers les recrues travailleurs et soldats, originaires des régions visées et des régions voisines.
>
> Or, jamais, à ces epoques, je n'ai été frappé par l'existence des cas de goitre (Van Campenhaut, p. 1654).

> Les indigènes font remonte à une cinquintaine d'années environ, l'apparition du goitre dans la région et l'attribuent au fait de boire régulièrement de l'eau de l'Ebola ou une des affluents.
>
> Ceux de la région du nord, Law-Est, prétendent que la plupart des goitres ont apparu chez eux depuis le displacement des villages des bords de l'Uelle vers l'intérieur, il y a six ou sept ans.
>
> D'aucuns affirment que rentrés d'un sejour chez des parents en région Ebola, ils ont vu leur goitre se développer quelques mois après (Baudart, p. 136).

In confirmation of the natives' reports Baudart cites figures of an incidence of 30.4 and 39.2 per cent, respectively, in two " chefferies " of 500 to 2000 people, as compared with the 24.3 and 34.1 per cent reported by Daloze six years previously. (Both Baudart and Daloze examined many other groups; the figures given are for the only two that were examined by both).

These claims by the natives are further supported by the fact that Alexander (a), travelling along the Ubangi and Uelle rivers as far as 29° 30′ E in 1905 remarked on the physical appearance of the women but made no mention of goiter.

That the disease was not strikingly prevalent on the French side of

[8] Lagae and van den Plas, 1922; Schotte, 1931; Daloze, 1933; van Campenhaut, 1934; Le Bihan, 1937; Baudart, 1939; *Congo belge, Rapports sur l'hygiène publique*, 1925-37.

Ubangi River even as late as 1912 may be inferred from the fact that it was not mentioned by either Bernard or Heckenroth in their reports. It is true that these were concerned chiefly with trypanosomiasis but an incidence of goiter of 25 to 40 per cent would scarcely have gone unrecorded.

Another great goiter region of the Belgian Congo is, or was, Katanga, in the southern and southeastern part (Mouchet and Gerard, Schotte, Calonne). Schotte listed in considerable detail those regions in the Belgian Congo in which goiter was then (1931) endemic and increasing in frequency, and additional information is to be found in the government reports for 1925 to 1937 inclusive. Some of these districts were crossed by Cameron in 1875, who did not mention seeing any goiter there, although as we have seen he did include the report of its occurrence in another region that he did not visit. On the other hand, it would appear from Livingstone's account (see p. 170) that goiter was present in the Katanga district as early as 1870. The official reports on the health of the inhabitants of the Congo from 1925 to 1937 (the latest available to me) present a continuous story of an ever-increasing spread of the disease. That for 1929 states that Daloze found an incidence of 45 per cent between Banzyville and Basinga in 1929 as compared with the same observer's estimate of 25% a year earlier.

It is of great interest to note that both Baudart and Calonne remarked that the goiters seem to have had no effect upon the general health and behavior of their bearers and that Mouchet and Gerard specifically stated (p. 573): "nous n' avons jamais pu y observer la présence de crétins ou de myxoedemateux." The official report for 1934 also remarks on the absence of cretinism, myxedema and of exophthalmic goiter.

Angola

To the south of the western part of the Belgian Congo is the Portuguese colony of Angola. The early history of its northwestern portion is closely related to that of the exploration of the Congo. Search of the early literature has failed to disclose any reference to goiter.

Even as late as 1884 to 1888, there seems not to have been any goiter in the country between Malange (160° 22′ E and 9° 28′ S) and places 17.30 E and 8° 3′ or 8° 45′ S (*Expidiçao portuegueza ao Muatiânvua*). No later reports as to conditions in this area have been found.

In 1854 and 1855 Livingstone (a) crossed and recrossed Angola at about 90° S. He made no mention of goiter in this region, though he

did remark on the physical appearance of the natives. Trevassos-Valdez, who was there from 1852 to 1857, also seems not to have seen goiters nor was their presence recorded by Douville (1828-1830) in this region, or further south to Bihé.

It will be recalled (cf. above, p. 166) that in 1875 Cameron crossed from east to west at about the middle of Angola (11°-13° S) without recording the presence of goiter. A part of his route was travelled, in reverse, in 1877 (Capello and Ivins, Pinto). Both of these reports mention the prevalence of goiter in the Bihé country. It may be that Cameron did not pass through the same villages as did Capello and Ivins and Pinto. Perhaps Cameron, since he was then travelling through comparatively well-known country, no longer found it necessary or advisable to record such matters as the presence of goiter. But it is also possible that there really had been a great change even in so short a time. Pinto's account is quite consistent with this view. He wrote (vol. 1, p. 287): "I had some of the men[9] on the sick-list, a few suffering from goiter" and (vol. 1, p. 303): "I must here remark that several of my followers were on the sick-list, suffering from a malady which, though sufficiently painful, was not without a touch of the ridiculous. Some 18 or 20 of them had got a goitre."[10] Whenever it was that goiter first appeared in Bihé, it was not uncommon in the highlands of Angola in 1894 (Chatelain) and was very frequent in Bihé in 1944 (Sarmento).

Union of South Africa

The first reference to the occurrence of goiter in the territory of the present Union of South Africa is to be found in a report of the Department of Public Health for 1928-29 (page 67):

> In the light of experience of this disease in other countries, notably Switzerland, Britain and the United States, some inquiries regarding goiter were made by the Department in previous years, but, although occasional sporadic cases were known to have occurred in certain parts of the Union, no endemic prevalence of the disease was discovered.
>
> In February last, however, an Assistant Health Officer of the Department investigated a reported prevalence of the disease in certain remote localities in the Uniondale district, through which flow tributary streams to the Coega River, and found the report to be substantially correct.
>
> In about half of these valleys a considerable percentage of the inhabitants suffer

[9] I. e., his bearers.

[10] Similar instances of rapid development of goiter were mentioned by Cameron (*supra*) and by Livingstone and by Stuhlmann (*infra*) and several were collected by Hirsch. See also p. 167.

from simple goiter; in the case of the Hoeree Valley it was estimated that about 65% of the total inhabitants show definite signs of thyroid enlargement. A history was obtained of two deaths during the past few years from extreme enlargement of the gland.

The disease is not common in the Union, but other small isolated groups of cases are believed or suspected to exist in the Pretoria district and one or two other localities.

This would seem to have been an almost ideal instance for a careful epidemiological investigation. The opportunity was neglected. Instead, years were spent in the analyses of the iodine content of foods. In 1934, Blom summarized this work as follows:

Iodine was determined in foodstuffs from different parts of South Africa including those from endemic goitre areas in the Uniondale district, and such widely differing results were obtained that no fixed relationship could be established between the iodine content of foodstuffs and the incidence of goitre.[11]

Other Parts of South Africa

(Southwest Africa, Bechuanaland, Southern Rhodesia, Mozambique)

The only information concerning goiter that I have found is in the official reports from Mozambique which, for 1933, 1934, and 1935 list a few cases of simple goiter, as well as one case of myxedema and cretinism.

Northern Rhodesia

The only report that I have found relates to the extreme northwestern corner and was given by Livingstone (b). It is, incidentally, part of the only mention of goiter in his books. On January 4, 1871, when he was nearing Nyangwa on the Lualaba, which he reached months later, he wrote (p. 354):

Mohamad mentioned this morning that Moenemokaia and Moeneghera, his brother, brought about thirty slaves from Katanga to Ujiji, affected with swelled thyroid glands, or "goitre," and that drinking the water of Tanganyika proved a perfect cure to all in a very few days. Sometimes the swelling went down in two days after they began to use the water, in their ordinary way of cooking, washing and drinking; possibly some ingredient of the hot fountain that flows into it affects the cure, for the people on the Lofubu, in Nsama's country, had the swelling.

Livingstone's map shows two rivers named "Lofubu" but the context makes it clear that the one meant is a tributary of Lake Muero of Moero, which, in turn, drains into the Lualaba.

[11] This report, like so many others, has been severely neglected by proponents of the iodine-lack hypothesis.

Nyassaland, Tanganyika, Kenya, Uganda

The Shire River, the outlet of Lake Nyassa, and the greater part of the western shore of the lake were explored by Livingstone and Livingstone, but as already mentioned they made no record of the presence of goiter. In 1877 Elton travelled along the west shore of the lake and then northward, crossing the two mountain ranges that bound the valley that leads from the northwest to the north of the lake. His journal contains no mention of goiter. Neither do the books by Giraud (1883-4) and by Drummond (1855). Near the northern end of the lake but still south of the range that divides Nyassaland from the former German East Africa, Cross saw goiters some time before 1897.[13]

However neither Cross nor any other traveller seems to have reported the presence of the disease at the south end of the lake or on the Shire River until 1922 (Stannus). All this country is now part of the Nyassaland Protectorate. The Annual Medical Reports for the years 1918 to 1921 inclusive make no mention of goiter and those for the next three years are not available. The report for 1925 lists three cases of goiter among the natives treated at the hospitals and those for each year thereafter, up to and including 1934, but excepting 1927 and 1928, list cases of goiter. In 1931, there were two Europeans and 31 natives treated for this disease at the hospitals.

As already stated, Elton in 1877, Giraud in 1883 or 1884 and Drummond in 1885, crossed the valley that leads from the northwest to the northern end of Lake Nyassa without noting the presence of goiter. However, at least since 1900, the disease has been prevalent in the country they crossed and in adjacent regions (Fülleborn; Reichskolonialamt, 1910-11; Steudel). Noteworthy is the presence of cretinism (1910-11).

This district is now a part of Tanganyika Territory. The various German reports made no mention of goiter elsewhere in the territory except that "Ein Fall von ausgedehntem Kropf" came to operation in Mahenge (8° 32′ S and 36° 38′ E) in 1908. However from 1925 to 1936 the annual medical reports of Tanganyika Territory regularly listed a few cases of goiter. Those for subsequent years did not distinguish between goiter and other endocrine disorders.

Tanganyika Territory stretches northward to the shores of Lake Vic-

[13] "Goitre or enlargement of the thyroid gland. I have seen this very often in Mlozi's village. I never saw any of the north end natives suffering with it." Mlozi's village was near the north end of the lake but south of the ridge that divided German from British possessions. Since Mlozi's village was peopled, chiefly, by Arabs and their slaves, it is possible that they introduced goiter into this district.

toria. This was first seen by Speke in 1859 and the country to the south, west and north was explored by Speke and by Grant (c. 1861-1863). They made no mention of goiter in their reports although Grant, at least on several occasions referred to the diseases of the natives.

The northeastern part of the lake lies in Kenya Colony. The medical reports for 1911 to 1938, inclusive, except those for 1923 and 1926 have been examined. The first reference to goiter is to the occurrence of exophthalmic goiter in a native at Kisuma, on one of the bays of Lake Victoria, in 1912. There is no other mention of goiter until 1922, when a European was also reported to have exophthalmic goiter. From 1924 to 1938, the last year for which I have seen a report, there was a gradual increase in the number of cases of thyroid disease, with exophthalmic goiter predominating. The first case of myxedema was reported in 1927.

To the west of Kenya lies the Uganda Protectorate. Along its western borders, in turn, are Lakes Edward and Albert. All this territory, as well as that to the south, around Lakes Kivu [13] and Tanganyika, has been quite thoroughly explored. I have found no mention of goiter in any of the early accounts examined except in that of Stuhlmann, who saw a great deal of goiter in the Semliki valley, which lies between Lakes Edward and Albert, in January and December 1891.

Curiously enough there is no mention of goiter in this region by either Casati, Stanley or Parke, a physician, who traversed it in May and June, 1889. Presumably their party included the person listed by Parke as having "Struma" at Fort Bodo nine months earlier (see above, p. 166). Did this individual carry the infection into a peculiarly susceptible community? Had it really spread so rapidly? [14] If present in 1889, how is it that neither Casati, Stanley nor Parke mentioned it?

Whatever the answers to these questions may be, it would seem that the development of the disease in *any given individual* was rapid, for Stuhlmann wrote (p. 642):

> Leute, die unterwegs das Wasser frisch aus dem Bache mit der Hand hastig tranken, litten angeblich alsbald an dem Übel; solche, die das Wasser erst längere Zeit in Thonkrügen in der Hütte aufbewahrten, blieben, wie man sagte, verschont.

A similar report as to the beneficial effect of allowing the water to stand had been given by Boussingault from Maraquita, Colombia, some sixty years earlier.

[13] Costermansville, at the south end of Lake Kivu, has since become a goiter center (Congo belge, *Rapports, after* 1934, not earlier).

[14] For instances of sudden epidemics of goiter see Hirsch; Anglesio; De Bernardinis, Bottaliga and Coppo.

Stuhlmann also wrote of goiter as " eine sonst bei Negern ausserordentlich seltene Erkrankung " (p. 316). This indicates that goiter was at that time unknown or rare in the better known parts of German East Africa and in all those parts of Africa that Stuhlmann traversed on his way from the eastern coast to meet Emin Pasha, or on his return.

The greater part of the Semliki valley is now included in the Belgian Congo. In the 1930's it was one of the great foci of endemic goiter (van Campenhaut; Congo belge, *Rapports*, 1932, 1933).

Ethiopia

Ethiopia or Abyssinia, as a Christian country in Africa, has been of great interest to Europeans for centuries. The earliest accounts that have been examined contain no mention of the diseases of the country, nor were these referred to by Poncet, a physician, in 1698 to 1700, who travelled to northern Ethiopia from Egypt and returned by way of Massawah. Bruce (1768-73) devoted ten pages to " diseases of the country " and gave a good description of what was unquestionably scrofula. In the table of contents of the account of his visit in 1809 and 1810, Salt listed " Diseases prevalent in Abyssinia " but the only disorders mentioned in the text were fevers. Pearce (1810-19) discussed various diseases, including scrofula, but not goiter. All of these authors had visited only the northern portions of the country, particularly the province of Tigré.

The first mention of goiter is to be found in the statement by Combes and Tamisier (1835-7): " Les Abyssiniens ne sont pas à l'abri des goîtres et des écrouelles." They had visited both the northern and southern portions of the country and it is possible that they observed the disease in the south and not in Tigré. Neither Lefèbvre (1839-43), Parkyns (1843-6) nor Plowden (1848) mentioned the presence of goiter in Tigré or elsewhere, although all three listed a number of other diseases. Even in Choa and Adel, in the more central and southern parts of Ethiopia, both Rochet d'Héricourt (1839, 1842) and Johnston (1842) failed to report goiter, although both mentioned a number of other diseases and in several places referred to the beauty of the women.

Pruner Bey, who lived in Cairo from 1834 to 1846, the first six years as Professor of Anatomy and Director of the Hospitals and later as a private physician, wrote that goiter was endemic in the highlands of Abyssinia. There is no statement as to his authority nor to what part of Abyssinia he referred. It may be that he obtained his information from Combes or Tamisier or from their book.

The earliest report of the observation of goiter in northern Ethiopia was given by Blanc, who was there in 1865, but did not publish until 1874. "La scrofule fait des ravages considérables dans les plateaux inférieurs, surtout dans une province voisine de Massawah, dans laquelle on rencontre également de monstrueux goitres" (p. 349). Noteworthy is the absence of any reference to the presence of goiter at the greater altitudes, further in the interior, also visited by Blanc.

It is also of interest that Courbon, who had been in Massawah for 18 days in 1859 and who also spent a month and a half in the interior, had written: "Bien que l'Ethiopie soit un pays de montagnes, on n'y rencontre pas le goitre." While we cannot be certain that Courbon had visited the "province voisine" to which Blanc referred, the contrast between the statements of 1859 and 1865 is striking.

Subsequently goiter became a very common disease in many parts of the country,[15] including Tigré (Singer, Castro, *a*, *b*, *c*; Mérat, Nägelsbach, Angelini and Scaffidi). Castro remarked on the absence of cretinism: "gli Abissini attribuisono ai gozzati una intelligenza superiore al normale" (b. p. 883; c. p. 348) and Singer and Mérat noted the infrequency of exophthalmic goiter.

Sennar

The Blue Nile flows northward from Ethiopia to join the White Nile at Khartoum. En route it passes the ruins of the city of Sennar, until about a century ago the seat of an independent kingdom. Poncet spent three months there in 1699 without noting goiter in his account. Bruce passed through in 1792 and listed the diseases he saw but made no mention of goiter. Cailliaud was in Sennar from July to November in 1821 and again for a short time in February 1822. He also devoted considerable space to the diseases of the inhabitants without mentioning goiter. By 1825 it was quite prevalent there (Brocchi, Vol. 5, p. 597).

Egypt

Our knowledge of the diseases of Ancient Egypt is considerable and has been authoritatively reviewed by Ruffer, Ebbell, Grapow, Dawson and by Fournier-Begniez. None of these gives any indication of the presence of goiter in Ancient Egypt. There seems to be no painting or carving, of

[15] De Cosson reported that "an enlargement of the glands of the throat, often ending in suffocation and death, is also no uncommon disease, to cure which the natives masticate a certain root." This may have been goiter but, more probably, was not.

the thousands and thousands that the Egyptians have left us, that depicts a goitrous person or cretin.[10]

It is true that Régnault regarded a statue of the god Bes as that of a cretin dwarf but the reproduction he published makes it quite evident that the statue is one of an achondroplastic dwarf. The legs are only half the length of the trunk and the hands come down only to the hips.

In his work *The Thyroid Gland in Medical History*, Iason produced a figure which he labelled "Egyptian carving showing goiter." Upon inquiry I was informed that this figure was taken from Ruffer. Comparison of the plates indicates that they are indeed of the same carving, but that in Ruffer is excellent and that in Iason is poor. The carving is "not a portrait in the modern sense, but simply represents the favored type for queens and goddesses in the Late Ptolemaic Period" (Bull). In any event the representation is the famous one at Denderah of Cleopatra the Great, she for whom Marc Antony lost an empire and his life!

Modern description of Egypt that is of interest to us may be said to begin with the report by Bruce of his travels from 1768 to 1775. He was followed about a decade later by Volney and by Sonnini. All devoted considerable space to the diseases observed in the natives, but none mentioned the presence of goiter.

The French occupation of Egypt in 1798 gave rise to a considerable amount of literature. In particular there was an official *Description de l'Egypte*, published in Paris from 1809 to 1818, which contains articles by Rouyer, Larrey and by de Chabrol that are of interest in this regard. Brocchi's account of Egypt in the 1820's was followed by those of Combes and of Hamont at intervals of about a decade each. All of these reports, over a period of seventy years, contain many passages dealing with the various diseases observed but none of them mentions the presence of goiter.

In 1812 Frank wrote: "Les sourds, les muets et les individus affectés du goitre ne s'y rencontrent presque jamais" and about 25 years later Pruner Bey stated that the disease was not endemic in Egypt.

Even as late as 1843, Yates, though making many references to diseases seen, or heard of, in Egypt, did not mention goiter.

Almost a century later Dolbey and Omar reported on the 216 cases they had treated between 1919 and 1923 and stated: "Simple parenchymatous or colloid goitre, with or without adenomatous or cystic degenera-

[10] Under date of April 22, 1947, Dr. Ludlow Bull, Associate Curator of the Egyptian Department at the Metropolitan Museum of Art, wrote me "I do not recall any Egyptian representation of a human figure showing an enlargement of the neck."

tion, is extremely common in the valley of the Nile." A few years later, in 1932, Ibrahim reported that in one village 18 per cent of the *men* had goiter and 3 out of 35 children were cretins.

It seems quite evident that endemic goiter in Egypt, as in Morocco, Nigeria and other parts of Africa, is a recent phenomenon.

Summary

The literature descriptive of Africa has been searched for accounts of the physique of the natives and for references to their diseases.

There is quite compelling evidence for concluding that goiter did not exist in Ancient Egypt nor in Roman North Africa. It also appears that both of these regions were free from goiter until a quite recent date but that the disease is now endemic throughout much of North Africa.

For many other regions, such as Nigeria, most of the Congo, and parts of East Africa the evidence is equally convincing that goiter is of recent occurrence and, at least up to about ten years ago, was rapidly increasing its territory.

As in the Americas, New Zealand and England, the history of goiter in Africa is that of a newly introduced epidemic disease.

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A PHYSIOLOGICAL AND PHARMACOLOGICAL APPRECIATION OF *HAMLET* ACT I, SCENE 5, LINES 59-73

DAVID I. MACHT*

Sleeping within mine orchard,
My custom always in the afternoon,
Upon my secure hour thy uncle stole,
With juice of cursed hebenon in a vial,
And in the porches of mine ears did pour
The leperous distilment; whose effect
Holds such an enmity with blood of man
That swift as quicksilver it courses through
The natural gates and alleys of the body;
And with a sudden vigour it doth posset
And curd, like eager droppings into milk,
The thin and wholesome blood: so did it mine;
And a most instant tetter bark'd about,
Most lazar-like, with vile and loathsome crust
All my smooth body.

This passage from Shakespeare is one of considerable medical interest dealing as it does with the method of murder employed in the death of Hamlet's father. It presents two interesting questions. The first is: What kind of poison was the substance called "hebenon"; the other is the problem of absorption of drugs and poisons through the ear. About thirty years ago, the present writer was engaged in an extensive investigation concerning the absorption of drugs and poisons through various unusual channels and in that connection experiments were made and published concerning the possibility of drug absorption through the intact and ruptured eardrum.[1] These experiments were published elsewhere, as well as various other papers dealing with the absorption of drugs and

* Department of Pharmacology, Laboratories, Sinai Hospital, Baltimore, Maryland.

[1] Macht, D. I., Pharmacological Appreciation of Shakespeare: Instillation of Poisons into the Ear. *Bulletin of the Johns Hopkins Hospital, 29*: 165, 1918.

poisons through the eye,[2] through the bladder,[3] urethra, ureters,[4] vagina,[5] uterus, and the skin.[6]

As to the identity of the poison mentioned in "Hamlet," numerous interpretations are to be found among commentators. Many of these are quoted in the Variorum edition of Shakespeare by Furness. Other hypotheses are cited by different annotators. The principal substances identified with *hebenon* as the word is written in the Folio edition of Shakespeare, or *hebona* as it appears in the Quarto edition, are as follows:

1. Grey thinks that *hebenon* stands by metathesis for *henebon* which is the same as the English *henbane*, a popular name for *Hyoscyamus niger*, because it was supposed to be very poisonous for hens.

2. Pliny in his *Natural History*, Book 25, Chapter 4, commented that oil made from the seeds of Hyoscyamus and instilled into the ear will be absorbed and injure the understanding.

3. Drayton in the book *Barons' Wars*, page 51, speaks of:

> The pois'ning henbane and the mandrake dread

4. Marlow in the "Jew of Malta" (*Collected Works*, page 164) has the following verse:

> The juice of hebon and Cocytus' breath.

5. Some writers naively connect the word *hebon* with the Hebrew word *eben* meaning "a stone" and think that the poison refers to the ebony tree which they regard as poisonous. "Eben" of course refers to the hardness of ebony wood, but not to its being poisonous.

6. Still other writers are of the opinion that *Hebenon* stands for hemlock, or the classical *Conium maculatum*, which Socrates was supposed to have taken.

7. Beisley in the work entitled *Shakespeare's Garden*, page 4, regards *hebenon* as being the deadly nightshade or *Solanum maniacum*, which is equivalent to stating that *hebenon* belongs to the Belladonna family and is related to *Atropa belladonna*.

[2] Macht. D. I., Absorption of Apomorphin and Morphin through the Conjunctiva. *J. A. M. A.*, *68*: 1230, 1917.

[3] Macht, D. I., On the Absorption of Drugs and Poisons from the Bladder and Urethra. *Jour. of Urol.*, *1*: 201 and *2*: 2, 1917.

[4] Macht, D. I., Absorption of Drugs and Poisons from the Ureter and Pelvis of the Kidney. *Jour. of Urol.*, *2*: 781, 1917.

[5] Macht, D. I., Absorption of Drugs and Poisons through the Vagina. *J. Pharm. and Exper. Therap.*, *10*: 509, 1918.

[6] Macht, D. I., Absorption of Drugs and Poisons through the Skin and Mucous Membranes. *Arch. Inter. de Pharmacol. et de Therap. 58*: 221, 1938.

8. In the new Sydenhem Society's lexicon a remark is found suggesting that *hebenon* was the crude oil of tobacco. This suggestion is rather a preposterous one and yet is possible because tobacco was introduced into England by Sir Walter Raleigh during Shakespeare's time, but strangely enough is never referred to directly by Shakespeare. This was probably due to Shakespeare's diplomacy and avoidance of giving offense to King James who wrote his "Contrablast against Tobacco." Furthermore, as has been shown by Macht, nicotine penetrates through the intact eardrum very readily, producing death.

9. A number of writers have identified *hebenon* with an entirely different poison of English origin. They think that *hebenon* is the active principle of the yew tree or *Taxus baccata*, and as a proof in support of their view quote passages referring to the yew tree and the name *heben* applied to it. Thus for instance, in Spenser's *Fairie Queen*, Book I, Introduction 3, we have this line:

> Lay now the deadly heben bow apart.

And again in *King Richard II*, Act 3, Scene 2, we read:

> To bend their bows of double fatal yew,

referring both to the deadly wound produced by arrows shot from the yew bow and also to the poison contained in the yew wood. The chief advocates of this view are Brinsley Nicholson,[7] W. A. Harrison,[8] and L. H. Grindon.[9]

The present communication deals with quite another aspect of physiology and pharmacology inadvertently alluded to by the poet, and in this instance is an excellent illustration of how scientists, experienced observers though they may be, often fix their attention predominantly on a certain phenomenon to the exclusion of all others, so that many a wonder of nature will escape their notice. In lines 68-70 of the passage before us, allusion is made directly to the curdling effect of the poison on the blood and yet the present writer thirty years ago when he was interested primarily in the absorption of poisons through unusual channels paid no attention to this coagulation phenomenon at that time.

> 68 And with a sudden vigour it doth posset
> And curd, like eager droppings into milk,
> 70 The thin and wholesome blood: so did it mine;

[7] Nicholson, Brinsley, *Transactions*, New Shakespeare Society, page 21, Nov. 14, 1879.
[8] Harrison, W. A., *Transactions*, New Shakespeare Society, page 295, May 12, 1882.
[9] Grindon, L. H., *The Flora of Shakespeare*, London 1883.

In the last six years the writer has been intensively and extensively engaged in studies on coagulation of the blood produced by various drugs, so that when he reread the above lines the query immediately arose in his mind as to whether the poison mentioned by Shakespeare exerted a thromboplastic or coagulation effect on the blood of animals and human beings. In order to clear up this problem, an experimental investigation was undertaken, the results of which are published in detail elsewhere.[10] In this place a brief summary of the results obtained is given in order to elucidate the lines from Shakespeare and to promote a greater appreciation of the dramatist's wide knowledge.

Experiments were undertaken to ascertain the effect on blood coagulation of rabbits, cats and human beings after administration of a number of galenical drugs known in Shakespeare's time, and also in addition, of other drugs found in the present Pharmacopeia, which were employed as controls. As far as Shakespeare is concerned, the main drugs to come into consideration were the Belladonna family, and of these primarily, *Hyoscyamus* and *Belladonna* itself. Another drug to be considered here would be the mandrake or *Mandragora officinalis* which also consists principally of the belladonna alkaloids, but which was embellished by superstition with other magic properties. It was both soporific and delirifacient, and when the plant was pulled up by its roots it was claimed that the shrieks emitted were paralyzing. Compare the following passages:

> Were such things here as we do speak about?
> Or have we eaten of the insane root
> That takes the reason prisoner?
>
> *Macbeth*, Act I, Sc. 3

> Would curses kill, as doth the mandrake's groan,
> I would invent as bitter scorching terms
>
> *King Henry IV*, Act III, Sc. 2

> So early waking, what with loathsome smells,
> And shrieks like mandrakes', torn out of the earth,
> That living mortals hearing them run mad—
>
> II *King Henry IV*, Act III, Sc. 2

The historical and scientific properties of mandrakes have been described by Macht elsewhere.[11]

Another drug known to Shakespeare and tested by the present writer was hemlock. Still another was aconite, or wolfsbane, or monkshood.

[10] *J. A. Pharm. Association*, 121: 26, 1949.

[11] Macht, D. I., Mandrakes . . . in the Bible, Literature and Pharmacology. *American Druggist*, page 1, December 1933.

Aconitum is not mentioned in the passage before us but is alluded to by Shakespeare elsewhere. Thus, in the second part of *King Henry IV* we read as follows:

> And thou shalt prove a shelter to thy friends;
> A hoop of gold, to bind thy brothers in;
> That the united vessel of their blood
> Mingled with venom of suggestion
> (As, force perforce the age will pour it in)
> Shall never leak, though it do work as strong
> As aconitum, or rash gunpowder.

The same poison, aconite, is probably alluded to in *Romeo and Juliet*:

> A dram of poison, such soon-speeding gear
> As will disperse itself through all the veins
> That the life-weary taker may fall dead,
> And that the trunk may be discharged of breath
> As violently as hasty powder fired
> Doth hurry from the fatal cannon's womb.
>
> *Romeo and Juliet*, Act V, Sc. 1

because it is well-known at the present time and was known even to the ancients that aconite was one of the most potent and rapidly acting deadly poisons.[12] In addition to these four drugs numerous other tests were made with tinctures, or alcoholic extracts of a large number of vegetable drugs. Table I gives briefly the names of the substances examined and also the effects on coagulation found after their use.

The experiments were done both in vitro and in vivo. In one series of experiments small quantities of the tinctures were introduced into vials and allowed to evaporate. Then they were taken up with physiological saline solution and the effect on blood coagulation from rabbits, cats and men was measured in vitro.

In other experiments suspensions or solutions of the drugs were injected intravenously into rabbits and blood obtained from the circulation was studied with regard to the speed of coagulation by the so-called Howell's or Lee and White method.

Finally, and most interesting of all, a large number of experiments were performed by introducing aqueous suspensions of the various drugs by stomach tube into rabbits and then obtaining samples of the circulating blood and studying its rapidity of coagulation.

The results obtained were very interesting. Some of the old drugs

[12] Macht, D. I., Comparative Toxicity of some Powerful Drugs for the Cat. *Proc. Soc. Exper. Biol. and Med. 35*: 316, 1936.

and particularly those which come under consideration in connection with *Hamlet*, namely, hyoscyamus, belladonna, conium, and aconite, all produced marked shortening of coagulation time. Other substances employed as controls did not produce this effect. The following protocols of experi-

TABLE I

List of Drugs Examined

Tincture of	Digitalis	Coagulation time	decreased
"	" Strophanthi	"	"	decreased
"	" Opii	"	"	decreased
"	" Opii Camphoratae	"	"	slightly decreased
"	" Arnicae	"	"	prolonged (in vitro)
"	" Nucis Vomicae	"	"	no change
"	" Aconiti	"	"	decreased
"	" Cinchonae Compound	"	"	no change
"	" Lobeliae	"	"	no change
"	" Hyoscyami	"	"	decreased
"	" Belladonnae fol.	"	"	decreased
"	" Stramonii	"	"	slightly decreased
"	" Valerianae	"	"	no change
"	" Balsami Tolu	"	"	no change
"	" Aloes	"	"	no change
"	" Flx Gentianae	"	"	no change
"	" Flx Hydrastis	"	"	no change

ments will suffice as illustrations, inasmuch as more complete data are published elsewhere.

Another interesting discovery was made in connection with this investigation. It was found that opium given by mouth, and even morphine itself given by injection, also produced a definite shortening of coagulation time. Opium was of course known in Shakespeare's time, as can be seen in the following passages:

> I could do this; and that with no rash potion,
> But with a ling'ring dram, that should not work
> Maliciously like poison:
>
> *Winter's Tale*, Act I, Sc. 2

> Nor all the drowsy syrups of the world,
> Not poppy, nor mandragora,
>
> *Othello*, Act III, Sc. 3

TABLE II

Experiment 1:	Large Grey Rabbit 2000 Gms.	
June 24, 1948		
10.00 A. M.	Normal Coagulation Time	14 mins.
11.00 A. M.	" " "	14 mins.
11.50 A. M.	" " "	15 mins.
11.55 A. M.	Given by stomach tube 1 cc. Tr. Hyoscyami	
2.15 P. M.	Coagulation Time	3 mins.
June 25, 1948		
10.20 A. M.	Coagulation Time	21 mins.
Experiment 2:	Rabbit 1600 Gms.	
10.05 A. M.	Normal Coagulation Time	6 mins.
10.08 A. M.	Given by stomach tube 1 cc. Tr. Belladonnae	
10.45 A. M.	Coagulation Time	1 min.
2.15 P. M.	Coagulation Time	2 mins.
Experiment 3:	Rabbit 1800 Gms.	
10.23 A. M.	Normal Coagulation Time	5 mins.
10.25 A. M.	Given by stomach tube 1 cc. Tr. Aconiti	
11.30 A. M.	Coagulation Time	2 mins.
1.45 P. M.	Coagulation Time	1½ mins.
Experiment 4:	Rabbit 1700 Gms. (Control Experiment)	
10.30 A. M.	Normal Coagulation Time	6½ mins.
10.33 A. M.	Given by stomach tube 1 cc. Tr. Cinchonae Comp.	
11.35 A. M.	Coagulation Time	6½ mins.
1.50 P. M.	Coagulation Time	6½ mins.
Experiment 5:	Rabbit 1200 Gms. (Control Experiment)	
10.35 A. M.	Normal Coagulation Time	6 mins.
10.38 A. M.	Given by stomach tube 0.5 cc. Tr. Nucis Vomicae	
11.40 A. M.	Coagulation Time	6 mins.
1.55 P. M.	Coagulation Time	6 mins.

COMMENT

It is thus seen that Shakespeare's description:

> And with a sudden vigour it doth posset
> And curd, like eager droppings into milk,
> The thin and wholesome blood: so did it mine;
> And a most instant tetter bark'd about,
> Most lazar-like, with vile and loathsome crust
> All my smooth body.

is a true metaphor. The drug, *hebenon*, probably did produce or promote coagulation of the blood even though Shakespeare may have made the statement inadvertently. The findings with aconite are interesting in connection with the famous passage in the second part of *King Henry IV* quoted above. The ancient belief was that powerful poisons and especially aconite, seeped through or leaked through the walls of the vessel containing it. This conveys a double significance to the pharmacologist. In the first place, experiments already published by the present writer have revealed that aconite is rapidly absorbed through the skin and mucous membranes. In the second place, aconite was found by him to promote blood coagulation and we may well concede that when introduced into the living body and producing a blood coagulating effect, it is not likely to leak through the vessel walls.

Whether the poet was actually aware of the exact physiological and pharmacological properties of the drugs interpreted to be "hebenon" or "hebona" is of course very doubtful. But there is no doubt that Shakespeare was well acquainted with the poisons of the Middle Ages. The trope employed in the present instance is not catachrestic, but on the contrary is both impressive and true to nature. Perhaps this writer may be accused of reading into Shakespeare's lines thoughts which he never entertained. To this let me reply with a trenchant quotation from the genial Oliver Wendell Holmes' *Autocrat of the Breakfast Table*:

> A child's reading of Shakespeare is one thing, and Coleridge's or Schlegel's reading of him is another. The saturation point of each mind differs from that of every other. But I think it is as true for the small mind which can only take up a little as for the great one which takes up much, that the suggested trains of thought and feeling ought to rise above—not the author, but the reader's mental vision of the author, whoever he may be.

To the medical reader, the present researches will enhance his enjoyment of *Hamlet*. Moreover, in the present instance the reading of Shake-

speare's lines was directly conducive to the starting of experiments which have a direct bearing on clinical medicine.

One other psychological lesson impresses itself in this connection. Thirty years ago the present writer, being engaged in the study of drug absorption through devious channels, concentrated his attention on the problem of penetrations of poisons through the ear. It is only recently, while engaged in the phenomena of blood coagulation, that his attention was riveted by Shakespeare's words:

> And with a sudden vigour it doth posset
> And curd, like eager droppings into milk,
> The thin and wholesome blood: so did it mine;

We can well appreciate the words of Professor Krogh, the Nobel prize winner in physiology, uttered at the International Physiological Conference in Boston:

> We may fondly imagine that we are impartial seekers after truth—but with a few exceptions, to which I know that I do not belong, we are all influenced, and sometimes strongly, by our personal bias, and we give our best thoughts to those ideas which we have to defend.

MEDICINE AND POLITICS: A 17TH CENTURY EPISODE

CHARLES F. MULLETT

The present excitement in the United States and Great Britain over governmental interference in medical practice has a long history, a history altogether varied in its manifestations. Many of these incidents were quite remote from what is now included under "socialized medicine," but at least in one form or another they involved the independence of the medical profession, especially as concerned the standards and control of practice. Sometimes—the history of economic institutions illustrates how commonly this phenomenon marks the age-old conflict between freedom and organization—a group, which in later times has resolutely opposed state direction, once opened the door to that direction either by invitation or by admitting its own inability to handle a particular crisis. Such a situation occurred late in seventeenth century England, during the reign of William and Mary, when the governors of St. Thomas Hospital discharged several surgeons for reasons that to the victims seemed inadequate and under circumstances which they regarded as inequitable. The surgeons thereupon petitioned the king for a hearing and for reinstatement.[1] To bolster their cause they gave the particular case of one of their number, John Browne, more detailed exposition. Irrespective of the merits of the dispute, a brief summary of its background, particularly as related to Browne himself, will set the petition in clearer perspective.

John Browne (1642-1700?), born at Norwich, the home of the more famous Thomas Browne, to whom John was no kin, studied at St. Thomas from whence he entered the navy as a surgeon. After some service he returned to practice at Norwich and there wrote the first of his respectable series of books.[2] He then (1677) migrated to London where Charles II

[1] El. 9443, Huntington Library, San Marino, California: reproduced by the kind permission of the library authorities. The document bears no date but it may safely be placed in 1691 from evidence which will be brought out below. The petition is in the Ellesmere Collection which contains papers of the Earl of Bridgewater (1646-1701), one of the Privy Councillors and a highly esteemed member of the inner circle of government.

[2] The details of this paragraph have been derived from the excellent sketch by J. F. Payne in the *Dictionary of National Biography*. Browne's writings include:

A Treatise of Preternatural Tumours (London, 1678)

A Complete Discourse of Wounds (London, 1678)

Adeno-Choiradelogia, or an Anatomick-Chirurgical Treatise (London, 1684). This had three parts: "Adenographia, or an Anatomical Treatise of the Glan-

appointed him senior surgeon at St. Thomas.[3] Presumably other surgeons received royal appointments at this or later times. In 1691, complaints arose that several surgeons were not obeying hospital regulations and that, being royally appointed, they were denying their responsibility to the governors who thereupon put them out and replaced them with others. When the privy council on petition from the ousted surgeons sought an impartial investigation, the lords commissioners, who directed the affairs of the realm during William's absence in Ireland and on the continent, delayed action. Later on, they overtly sustained the action of the governors.

Partisan politics may have influenced the expulsion. The surgeons owed their appointment to Charles II or James II, and the president of the hospital, Sir Robert Clayton (1627-1707), was a stalwart Whig politician and merchant. Devoted to the interests of St. Thomas, he contributed generously to it as well as to Christ's. Since the surgeons had been serving in the Royal Navy and Browne himself in later years became surgeon to William III, the political factor indeed may have had no part, yet in those days political animosity ran so intensely, even fanatically, that no one knew when or where it might take a toll. Moreover, first the dilatoriness of the lords commissioners, then their decision in favor of the governors suggests partisan considerations. On the other hand, the course of events may only attest the disinclination to interfere in the affairs of a private corporation, so jealous of its rights that the governors refused to admit a royally appointed steward. In 1698 Browne again petitioned for reinstatement but without success. Apparently no personal prejudice jeopardized his case, for he was recognized as generally competent, and one of his books went through four editions in a short time.

The petition also has interest independent of the background strife. The surgeons had given over their private practice to serve the king, and upon discovering their ouster they feared lest such action prejudice their

dules"; "Choeradelogia, or an Exact Discourse of Strumaes or King's Evil Swellings"; "Charisma Basilicon, or the Royal Gift of Healing Strumaes etc., by Contact or Imposition of the Sacred Hands of Our Kings of England and of France."

Myographia Nova, or a Graphical Description of All the Muscles in the Human Body (4 eds., London, 1684-98)

The Surgeon's Assistant (London, 1703).

[3] According to Payne, Browne was picked over a better qualified man, Edward Rice, who had taken charge during the plague of 1665 when the surgical staff deserted the hospital; it appears unlikely after so long an interval between the appointment and the petition that this circumstance had anything to do with the removal of Browne.

professional future. To what extent the other surgeons had been guilty of the same trespass as Browne in treating a patient without a physician's presence is not clear, but such a misdemeanor occurred often. For generations tradition had placed the surgeon below the physician and circumscribed his activity. Any physician of London might practice surgery,[4] but no surgeon could practice medicine unless he was also a physician. For years also the courts had affirmed the right of the College of Physicians to control practice and had penalized surgeons for not confining their efforts to external matters.[5]

The authority of the king to force an appointment had been denied in 1681 in a suit involving a mandamus to the College of Physicians to receive Dr. Christopher Merret as an honorary fellow.[6] The chief Justice declared that no mandamus lies, for the college was a voluntary society and precedents stood against the mandamus. Moreover, in the very years in which the following petition of the surgeons was being presented, the College of Physicians brought an action in which the court held the defendant's plea of liberty to practice under some Letters Patent of Charles II an "ill" plea.[7] Although the independence of the College of Physicians was not the same as that of St. Thomas Hospital it is highly probable that the same principle was assumed in both cases. The whole episode then touches items beyond the immediate predicament of the persons involved.

To the King's Most Excellent Majesty in Council

The Humble Petition of the late Surgeons of St. Thomas Hospital [8]

Sheweth

That your petitioners having faithfully served in your majesty's hospital for divers years as surgeons, and have shown their extraordinary care and skill in curing the sick and wounded, and more

[4] 32 Henry VIII, c. 40 (1540).

[5] *Dr. Laughton v. Gardener* (1607), Cro. Jac. 121; *Dr. Bonhams Case* (1609), 8 Co. Rep. 107a, 114a; *Everard v. Hopkins* (1615), 2 Bulst. 332; *Corporation of Physicians v. Doctor Tenant* (1613), 2 Bulst. 185; *College of Physicians v. Butler* (1632), Jones W., 262; Sty., 433 (1654); *Dr. Goddard's Case* (1660), 1 Lev., 19. See also Charles Goodall, *The Royal College of Physicians of London Founded and Established by Letters Patent, Acts of Parliament, Adjudged Cases, etc.* (London, 1684), 357-472, for the many convictions against malpractice in the 17th century.

[6] *The King against the College of Physicians* (1681), 2 Show, 178.

[7] *The College of Physicians v. Bush* (1691), 4 Mod., 47.

[8] I have modernized the spelling and capitalization.

particularly (since the beginning of the War) where the last summer they discharged thence 1771 cured by your petitioners, most of which were sent from your royal navy desperately wounded.[9]

That some of the governors of the said hospital, being willing to introduce their own friends, had formed parties to turn out your petitioners, and at a late court voted them out of their places for no other reasons than that they came in by mandates, not summoning near one hundred of the governors, who had a right to sit at the same court.

That upon humble application to the queen's most excellent majesty in council, and both parties being heard by their counsel, the lords of the council humbly moved her majesty for a commission of visitation by consent of both sides, which her majesty was graciously pleased to grant, and although it hath passed her royal signet, and the privy seal, yet it is delayed by the lords commissioners of the great seal, for reasons unknown to your petitioners, whereby they are altogether deprived of the royal favor designed them by her sacred majesty, and having lost their chief practice to attend your majesty's service, are hereby like to receive great prejudice in their several employments.

And whereas your sacred majesty was pleased by your letter to recommend a steward to the same hospital, yet in disobedience to your command, they have also refused to receive him, and have made choice of another at a late court, for no other cause, but his insisting upon your royal mandate.

Your petitioners therefore humbly pray, that your majesty will be graciously pleased to give directions that the said commission may pass the great seal, in order to settle and regulate the said hospital, whereby your petitioners may be enabled to make good their complaints, and manifest your majesty's authority there.

And your petitioners shall ever pray &c—

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[9] The reference to the large number of men from the navy who were desperately wounded relates to the disastrous defeat suffered by the English at French hands at Beachy Head, June 30, 1690. William was in Ireland from June to September of that year and Mary took over the reins of government.

" John Brown's particular case "

He was bound to the faculty at Surgeon's Hall in the year '59. He served his majesty as surgeon in several capital ships at sea in '65 and '66.

He was surgeon to my Lord Peterborough's regiment in '72/3

He was sworn surgeon in ordinary and in waiting to King Charles 2d in '81.

He was recommended to St. Thomas Hospital by King Charles 2d as surgeon in '83 and he was freely elected thereto at a general court before the judgment in the quo warranto. He is allowed an experienced surgeon both by the College of Physicians and his majesty's surgeons, and has his Diploma from the company for his being an approved surgeon. He is fitly qualified for serving their majesties as surgeon general of their naval forces, he being both loyal and faithful to their majesties and present government, certified under the hands of several of the honorable privy council. He has been very diligent and careful in the exercise of his office, both as surgeon and senior surgeon of the hospital, wherein he hath practised above 8 years, and hath performed many eminent and great cures, and the last summer, he gave his daily attendance there above 12 weeks, and was at a great expence for medicines towards the curing the sick and wounded, not hitherto satisfied, his salary being but 40 l. per ann., out of which he finds all external medicines used in the said hospital, and for this he hath 3 ample certificates to produce, signed by several of the governors, and one given him under their hands, since his discharge from the hospital, of his great care, skill, and diligence, whilst he was there concerned. The great crimes laid to his charge was his taking off a boy's leg above the knee and curing it, but for his not calling in the doctor to see the operation, he was respited from the hospital for about 3 weeks before he was restored, and although the governors at the late court in which he was turned out had nothing else to charge him with, but this and his coming in by mandate, yet this was thought fit to be again alleged against him, and made the only reason for his being dismissed the hospital by a part of the governors above a hundred [10] of them not being sum-

[10] In the list of governors omitted (135 all told) were William Sancroft (1615-93), late Archbishop of Canterbury (he had been deprived of his ecclesiastical office for refusal to take oaths of allegiance to William and Mary), John Evelyn (1620-1706), the well-known virtuoso and diarist, William Sherlock (1641-1707), Dean of St. Paul's,

moned thereto who had a right to sit at the same court, as is humbly certified in the petition to his majesty in council, whose names are hereunto annexed.

the center of a stormy political controversy at this very time, the popular Dr. John Radcliffe (1650-1714), and one John Bull, distinguished for his name if nothing else. The presence of the Dean of St. Paul's among the governors may have followed from that provision in the "Act for the appointing of Physicians and Surgeons," 3 Henry VIII, c. 11 (1511): no person within the city of London or seven miles of it to exercise "as a Physician or Surgeon, except he be first examined, approved, and admitted by the Bishop of London, or by the Dean of St. Paul's for the time being. . . ."

A NOTE ON THE ANTIQUITY OF THE ADRENO-GENITAL SYNDROME

HARRY KEIL

During the past two decades many observers have recorded examples of masculinizing changes in women suffering from abnormalities in various endocrine organs. These sexual aberrations are often grouped under the title of adreno-genital syndrome, the implication being that the abnormalities are primarily or ultimately caused by changes in the adrenal cortex. Among the organs which may be affected in women showing masculinizing features are the adrenal gland, pituitary gland, ovary,[1] thymus and so forth. Extended study is often essential to determine which organ is the primary site of disease. Despite the vast literature on this subject, no one seems to have noted that the ancient Greeks recorded two instances of the adreno-genital syndrome. In one of the cases the clinical features were given in sufficient detail to warrant recognition of the syndrome. In Epid. VI, Sect. 8, 32 the following description was provided, which I am rendering into English from Littré's French translation of the original Greek text (vol. 5, p. 357):

> At Abdera, . . . (a married woman) had had children previously; but her husband having fled,[2] her menses became suppressed for a long time; afterwards, pains and redness in the joints . . . ; the body assumed a masculine appearance, this woman became hairy all over, a beard appeared in her, the voice became rough; and in spite of all that we could do to restore the menstrual flow, it did not come; this woman died not long after. The same thing happened to . . . (a married woman) in Thasos; according to all the physicians that I met, the only hope of restoring her womanly attributes lay in the return of the menses; but in her also, despite all measures, the menses did not return; this woman soon succumbed.

[1] Arrhenoblastoma is the name for one of the tumors in this organ causing masculinizing changes. It is derived from arrhen, male; blast-, germ; and -oma, a spurious Greek suffix which in the past one hundred years has come to mean swelling or tumor.

[2] The German translation of R. Fuchs (*Hippokrates: Sämmtliche Werke*, Bd. 2, 1897, p. 291) interprets this passage as meaning that the husband of the patient was banished. Littré's translation makes more sense and is here retained. Anyone who has seen an instance of the syndrome in question will understand the behavior of the husband who fled from his wife.

These two cases were briefly mentioned by Diepgen [8] in an extensive discussion of the significance of amenorrhea in relation to the humoral theories of the ancient Greeks. But nowhere does Diepgen suggest that these cases were examples of the adreno-genital syndrome. It may be noted, also, that these protocols are found in a so-called spurious treatise in the Hippocratic Corpus. However, the work is spurious only in the sense that it was probably not written by the shadowy Hippocrates himself. In every other respect the treatise is genuine, and its ancient vintage has been established beyond doubt. The manner in which the clinical data, particularly those of the first case, were recorded over two thousand years ago is worthy of notice. It is equally interesting to realize that in its essential features the adreno-genital syndrome has remained fundamentally unchanged throughout the ages.

Addendum

R. Blanchard (*Bull. de l'Acad. de Méd.* 76: 47. 1916) gave an incomplete translation of the Hippocratic passage, and he concluded that masculinity in women was caused by disease in the "interstitial glands" of the ovaries. H. D. Rolleston (*The Endocrine Organs in Health and Disease, with an Historical Review*, London, 1936, p. 361) abbreviated Blanchard's translation, but correctly interpreted the data as signifying evidence of the adreno-cortical syndrome. The same data in abbreviated form may be found in S. Silver (*Bull. N. Y. Acad. Med.* 16: 368, 1940) in a discussion of the Cushing Syndrome. These partial citations do not provide an adequate picture of the remarkable clinical knowledge exhibited by the ancient Greeks, and for this reason the complete translation is necessary for historical evaluation.

[8] Diepgen, P.: *Die Frauenheilkunde der alten Welt*, München, 1937, p. 194 (Handbuch der Gynäkologie, ed. W. Stoeckel, Bd. 12, I). I am indebted to Dr. Owsei Temkin for having called to my attention this interesting reference.

MEDICO-HISTORICAL NEWS AND ACTIVITIES

A TRIBUTE TO ARTURO CASTIGLIONI

ON THE OCCASION OF HIS 75TH BIRTHDAY, APRIL 10, 1949

It was Georg Brandes, I believe, who in his biography of Voltaire cited the answer of the Abbé Sieyès who, when asked "what did you do during the French Revolution," answered: "I survived."

There is a pristine quality to survival which evokes, with an uncommon immediacy, the enthusiasm of every man. Nestor, I am sure, was as much admired because he was venerable as for his wisdom.

This matter is less subtle than it seems for the accidents of fate and fortune notwithstanding, endurance is a fine test of mettle. As of things, so of men, to have withstood the dissipating influence of time and adversity is an attestation of the compactness and substantiality of their being. It is not for naught that the diamond is both brilliant and hard, and endures to its proper advantage contact and impact with all else.

These, dear Arturo, may seem odd similies, and fanciful analogies with which to initiate what in effect is intended as the salutations of your friends on your seventy-fifth birthday. For surely you with your gay twinkle and ready smile can little be thought of as "venerable," and though brilliant, you have never been "sharp and bruising" like the diamond. Wherefore then all this to-do about endurance and all that?

The warrant, dear Arturo, lies in the memory of that happy occasion when we gathered to celebrate your seventieth birthday, and antecedent to that, the memory of the time when you first found refuge among us, an exile from your own land. When first you came, you were as Sigerist so well observed, "like an eagle whose wings had been clipped." When you rose to respond to our collective toast on the occasion of your seventieth birthday you were the Cicero of old, sounding now our harsher tongue with the same eloquence as in the past you intoned the *lingua Romana*. In the intervening few years you had not only acquired a competence in our tongue but had resumed your productive studies, at Yale and elsewhere, enthusing the young and enriching our knowledge.

Contemplating your bibliography and the catalogue of your many achievements as teacher and special lecturer; beholding the ample list of honors which have been conferred upon you and which attest to your many merits, I can well see that what we witnessed in that brief period when you were in our midst, was but a sample of those qualities to which I alluded in the term "endurance." For, to amplify it but a bit, neither survival nor endurance can be attained by passivity, they are the issues rather of a skill in meeting the challenges of time and occasion.

You, my dear Arturo, have been preeminently competent in transmuting your days, your strength, and your abilities into the precious substance and texts of our discipline.

Speaking for your numerous friends here in our land and elsewhere also, I wish you many more years of life and effectiveness, and if in this salutation I have

underscored the qualities of endurance and effectiveness, I am sure you will understand that, besides celebrating these as among your outstanding virtues, I feel that they need to be underscored as a bulwark against despair and the "failure of nerve" which menaces us all.

IAGO GALDSTON

ANNOUNCEMENTS

NATIONAL NEWS

Army Medical Library

Coincident with the annual national drive of the Red Cross in March, the Army Medical Library had on display an exhibit on "The Red Cross, Its Origin and Development." Miss Robina Rae, Curator, Museum, The American National Red Cross, Washington, D. C., cooperated in assembling the material (Army Medical Library, *News*, April, 1949).

Library of Congress

On March 12 to 18, the Exhibit-of-the-Week is displaying the first edition of the collected works of Paracelsus, thus marking the opening of the Swiss Books Exhibition scheduled for March 16 (Library of Congress, *Information Bulletin*, March 8-14, 1949).

Illinois

Mrs. Ilza Veith, who obtained a Ph. D. degree in the History of Medicine at the Johns Hopkins University in 1947, has been appointed Lecturer in the History of Medicine in the Department of Medicine and the Division of Social Sciences at the University of Chicago.

New York

The Mount Sinai Hospital has scheduled a Seminar in the History of Medicine for Tuesday, March 29, 1949, 8.30 p. m., with the following program:

History of Knowledge of Islet Adenoma of the Pancreas
EDWARD ROSTON, M. D.

A Passage from the Fifteenth Chapter of Gibbon's History
DAVID KROHN, M. D.

The Modern History of Our Knowledge of the Pancreas
MAX ELLENBERG, M. D.

Wisconsin

Dr. G. Kasten Tallmadge has been appointed Professor of Medical History at the Marquette University School of Medicine (*J. A. M. A.*, April 2, 1949, vol. 139, p. 947).

NEWS FROM ABROAD

Guatemala

A series of six lectures by Dr. Douglas Guthrie of the University of Edinburgh has been sponsored for March 1949 by the Universidad de San Carlos de Guatemala. The invitations to this course were sent out over the names of Lic. Gregorio Aguilar Fuentes, Dean of the Faculty of Juridico-Social Sciences, Lic. Julio Valladares M., Dean of the Faculty of Chemical and Pharmaceutical Sciences, and Dr. Carlos Mauricio Guzmán, Dean of the Faculty of Medical Sciences.

Mexico

On the occasion of the visit of Professor Douglas Guthrie, of Edinburgh to Mexico City, the following cycle of lectures, organized by Dr. J. J. Izquierdo, Professor of Physiology at the Faculty of Medicine, took place in this city and also in the city of Puebla, under the patronage of the National University of Mexico:

March 24. At the Faculty of Medicine.
Dr. Douglas Guthrie: Medicine: Art or science?

" 25. At the Faculty of Chemistry.
Dr. Douglas Guthrie: William Cullen and the history of chemistry.

" 26. At the University of Puebla.
a) Dr. J. J. Izquierdo: What steps were taken in the City of Puebla against the smallpox epidemics of 1779, 1797 and 1814.
b) Dr. D. Guthrie: The great epidemics in history.

" 28. At the National Academy of Sciences.
a) Dr. J. J. Izquierdo: Altieri's *Elementa Philosophiae*, used as a text for Arts degree by students in New Spain, early in the XIX Century.
b) Dr. D. Guthrie: The Spanish contribution to medicine.

" 29. At the National Academy of Surgery.
a) Dr. J. J. Izquierdo: The origins and field of activity of the surgeon in New Spain, till its fusion with medicine.
b) Dr. D. Guthrie: The genius of John Hunter.

" 30. At the Academy of Medicine.
a) Dr. F. Fernández del Castillo: Drug inspection in New Spain, in the XVII century.
b) Dr. J. J. Izquierdo: The old Faculty, the first Academy of Medicine, and the first School of Medicine and Surgery in Puebla.
c) Dr. D. Guthrie: Medical education in Scotland.

" 31. At the Anglo-Mexican Institute.
Dr. Douglas Guthrie: Sherlock Holmes and the medical profession.

BOOK REVIEWS

ERIC W. VINCENT and PERCIVAL HINTON. *The University of Birmingham, Its History and Significance.* Birmingham: Cornish Brothers, Ltd., 1947. vi + 240 pp., illustrated, map, bibliography. 25*s*.

Birmingham University has grown in fifty years on foundations slowly consolidated during the foregoing century by the promoters of vocational training in the midlands of England. This history shows that the two medical schools and the outstanding and public-spirited men who staffed them, from William Sands Cox a hundred and thirty years ago to Bertram Windle and Gilbert Barling at the turn of the century, played a preponderant part in this *praeparatio evangelica.* The university suddenly burst into flower when Joseph Chamberlain watered these roots with his own enthusiasm and the gold which he was so skilled at attracting from generous benefactors at the appropriate moment. Mr. Churchill has said, as our authors recall, that Chamberlain about 1900 was the most alive, sparkling, insurgent, compulsive figure on the public scene. He was certainly the most remarkable man who has come out of Birmingham, a character of contradictory motives, who excited admiration and dislike much as Franklin D. Roosevelt did in our own time. Without his intervention the University might have been a mere federation of existing institutes.

The book is well documented and full of interesting illustrations and portraits. It is a handsome production, and will be a useful permanent record; but its physical and literary style are both heavy. The authors build their story out of undigested extracts from official minute-books, and their own writing is sententious and turgid. They make it clear that the younger and weaker humanities' side has insensibly coloured the ethos of the whole, raising the original group of technical institutes into a real *studium generale.* The Barber Institute of Fine Arts has been particularly valuable in this cultural infiltration. It is an experimental institute unique in British education, a combination of seminars in the history and study of music and the graphic arts (though not in their techniques) with a museum and gallery endowed to select and exhibit examples of the finest quality only. In the hands of a man of genius it has made in one decade a mark which will excite emulation. Birmingham University has been fortunate in the calibre of its officials and professors; but the work of successive distinguished librarians has been thwarted by the impossible physical conditions of its divided and ill-housed library. The library ought to be the integrating nerve-centre of the university. But in this department Birmingham, whose city library has in a few generations become one of the great, live national collections, has let I dare not wait upon I will.

Readers of this Bulletin will be most interested in the medical chapters. The successful establishment, just before war began in 1939, of the unified hospitals centre and the linking with it of the fine new university medical school is the most significant part of this story, though American readers will perhaps be surprised that a scheme so familiar to them should be novel and exciting in England.

W. R. LEFANU

JUAN B. LASTRES. *Una Neurosis Célebre.* Lima, Peru: Empresa Periodística, S. A., 1945. 276 pp. Illustrated. 10 soles.

This study of Francisca Zubiaga Bernales de Gamarra (1803-1835), wife of General Augustín Gamarra, grand Marshal of the armies of Peru, and generally referred to as "La Mariscala" (the Marshal's wife), is a development of an earlier brief report, and discusses the psychologic and psychiatric aspects of the woman, who was an epileptic.

Francisca Zubiaga was born in Cuzco of mixed Cuzqueñan and Vizcayan ancestry. She was destined for a religious career, but delicate health as a young girl discouraged the severe monastic training of a novice. It is probable that the epileptic attacks began at this period.

At 20 she married General Gamarra, a much older widower, with one son. She bore him three children and was deemed a kind and devoted mother by her stepson. The younger children died early, and her gentle feminine personality seemed to change after that. She became domineering and arrogant, especially proud of her husband's rank and authority when he was promoted to Marshal. And later when he was elected President of Peru her aggressiveness was intensified.

During most of her adult life she was subject to epileptic seizures of the "petit mal" type. Dr. Lastres convincingly develops his thesis on the epileptic cause of her nervous irritability. He also refers to her geographic and historic background as significant contributors to a volatile temperament.

There are records of not a few cases of hysteria and epilepsy among the nervous Limenos of the late colonial and early republican periods. The violent political changes of the times would be bound to aggravate any mental or nervous instability. In Cuzco the social customs had been based on an almost ritual formality and the wars to consolidate the Republic produced a tremendous upheaval there as elsewhere.

As the Marshal's wife Doña Francisca moved with him from camp to camp and developed masculine and soldierly qualities, even to the alteration of her physical characteristics. The gentle wife and mother of the early years of marriage appeared now as a legendary amazonian figure on horseback, encouraging the troops and inspired by a passion to command. As mistress of the President's establishment she grew increasingly authoritative in her pronouncements and decisions. She once acted as deputy President during a brief absence of her husband. As a social arbiter she was supreme and superb. She is described at this period as "haughty, astute, cruel, using every means to conserve her eminence, and intriguing against her enemies."

But political upheaval and military reverses exiled her, while the Marshal was afield endeavoring to suppress rebellion. She found a haven in Chile, where she died after a brief sojourn, at the age of 32. Her death is considered as due to an injury occasioned during her flight. No doubt all the neurotic elements combined to intensify this last shock.

Throughout her official career there are notations of her periodic illnesses, sometimes spontaneous, and as often induced by social or political emergencies. With these attacks came the necessity to try to conceal their occurrence. The degenerative alterations in physical and mental equilibrium are traced by Dr. Lastres as those commonly associated with epilepsy. He reports however that the

shrewd native intelligence of La Mariscala seemed less subject to this deterioration than is usual. He also emphasizes the point that even in early life her physical contours and characteristics were those predisposing to nervous attacks of the convulsive type.

Her personality was a mixture of violent passion and pride, of womanly tenderness, and of intense patriotism. And even in her fall from power, the exile still preserved traces of a strong character and the dignity of her better days. Contemporary records are largely derogatory because of the dislike and fear engendered by the arrogant whims and political power of the President's wife. Unhappily her despotism was remembered while her virtues were forgotten.

Dr. Lastres states his objective is to show that the diverse psychic facets of her personality resulted from both heredity and environment and also were modified by the political situation of her time. These produced a unique woman, who in spite of her nervous affliction could play her part with emotion, with valor and with patriotism.

GEORGIANNA SIMMONS GITTINGER

GEORGE SEAVER. *Albert Schweitzer, the Man and His Mind.* New York: Harper and Bros., 1947. 346 pp. Illustrated. $3.75.

To the remarkable series of books about Albert Schweitzer, George Seaver has added a profound and discerning biography. Ten years earlier, Seaver had written a story of Edward Wilson of the Antarctic, describing him as "naturalist and friend." Mr. Seaver is particularly gifted in writing of men who have emerged out of the common run of mankind as Christian leaders. Wilson was a doctor, to be sure, "the right-hand man of both Captain Scott's expeditions to the Antarctic" but he was also something more—he was keen to recognize the content of a man's faith in relation to the concepts he derived from life, and the ethical values he set upon them. Having written perceptively about Dr. Edward Wilson, Seaver was ready to write with equal perception about Dr. Albert Schweitzer.

This remarkable biography, as its name implies, gives us two sketches, either of which might have been expanded into a full-sized book. The first is about "Schweitzer, 70 years old, doctoring with science and kindness the inhabitants of French Equatorial Africa, a great and honest thinker who has practised his conclusions for forty years, self-devoted, self-supported, living out his golden sermon. . . ."

How vividly he portrays the old doctor understanding the ways of the tribe among whom he lived. For many years Schweitzer felt grave concern about the "hire-purchase system" by which a wife was secured from her parents. In time, Dr. Schweitzer realized, that, like polygamy, such customs are a part of the whole structure of African life which it will take generations of education to eradicate. Drastic abolition of the custom, as of many others, would be a worse evil than their retention for the present.

The doctor gives an amusing instance of the summary way in which it may be necessary to deal with litigants:

> One morning the noise of an altercation at the Hospital was wafted up to our dwelling-house. In the night a patient had taken another man's canoe and gone out fishing by

moonlight. The owner of the boat surprised him as he returned at dawn and demanded for the use of the canoe a large monetary compensation as well as all the fish he had caught. By the laws current among the natives, this was his actual right.

The case was brought before me and, as often before, I had to act as judge. First I made known that on my land not native law, but the law of reason of the white man is in force and is proclaimed by my lips. . . .

I established the fact that both men were at the same time right and wrong. "You are right," I said to the owner of the canoe, "because the other man ought to have asked for permission to use your boat. But you are wrong because you are careless and lazy. You were careless because you merely twisted the chain of your canoe round a palm tree instead of fastening it with a padlock as you ought to do here. By your carelessness you led this other man into temptation to make use of your canoe. Of laziness you are guilty because you were asleep in your hut on this moonlight night instead of making use of the good opportunity for fishing."

"But you" I said, turning to the other, "were in the wrong when you took the boat without asking the owner's permission. You were in the right because you were not so lazy as he was and you did not want to let the moonlight night go by without making some use of it."

. . . I then gave sentence that the man who went fishing must give a third of the fish to the owner as compensation, and might keep one-third for himself because he had taken the trouble to catch the fish. The remaining third I claimed for the Hospital, because the affair took place here and I had to waste my time adjusting the palaver.

It was always interesting, when Schweitzer was on furlough, to listen to his presentation of the Africa story. He pointed out that some people in Europe did not believe in missionary work among primitives on the ground that they were far happier left alone. Then he would ask, "Are they happy? No, for they are the slaves of terrible superstitions. They have become the children of Fear. They live in constant fear of spirits, departed spirits, evil spirits; and in fear, too, of the fetish-men who are supposed to control the supernatural powers and perform all kinds of ceremonies to keep them away." Sudden death, as such, is something the African does not understand. "They seek for the 'culprit' . . . They have their secret societies to find out. So much has to be paid to the fetish-man who is sent to find out. And woe to the person to whom the finger of the fetish-man points! The most horrible methods of torture are employed to kill him."

"Now, you will understand what the Gospel means." Dr. Schweitzer explains how it means release from crippling fear. After they have been patients in a Christian Hospital they know that the destiny of men is in the hands of the same loving Father, whether the patient be black or white. "Some people think that the Gospel is too difficult to understand. No, it is exceedingly simple, as all the profound things in life are simple. And the Gospel of Love can be understood in every language. In fact it is latent in every human heart."

When he was a boy, he passed through the public square of Colmar one day. In the Champ de Mars there stood a statue of Admiral Bruat, the work of the great sculptor Bartholdi, designer of the Statue of Liberty in New York Harbor. At the foot of the statue the young Schweitzer saw the figure of an African Negro, whose wistful expression embodied the very soul of the perpetual suffering of his race. It was this look of haunted sadness that startled the boy and has never ceased to haunt the mind of the man. In later life he exclaimed in moving words against

the long series of injustices and cruelties that the colored races of mankind have suffered at the hands of Europeans. He concludes:

> Who can measure the misery produced among (the colored peoples) by the fiery drinks and hideous diseases that we have taken to them? If a record could be compiled of all that has happened between the white and the colored races, it would make a book containing numbers of pages, referring to recent as well as to early times, which the reader would have to turn over unread, because their contents would be too horrible. We and our civilization are burdened, really, with a great debt. We are not free to confer benefits on these men, or not, as we please; it is our duty. Anything we give them is not benevolence but atonement. For everyone who scattered injury someone ought to go out to take help, and when we have done all that is in our power, we shall not have atoned for the thousandth part of our guilt.

In the presence of suffering Dr. Schweitzer is at his best. Here is a primitive Negro whom his surgical skill has just rescued from an agonizing death.

> When the poor moaning creature comes, I lay my hand on his forehead, and say to him "Don't be afraid. In an hour's time you shall be put to sleep, and when you awake you won't feel any more pain." (The anesthetic is administered, both the doctor and his Negro assistant, Joseph, put on their long rubber gloves and start.) "I watch for the man's awakening. Scarcely has he recovered consciousness when he stares about him and ejaculates again and again, "I have no more pain! I've no more pain!" His hand feels for mine and will not let it go. Then I begin to tell him and the others in the room that it is the Lord Jesus who has told the doctor and his wife to come to the Ogowe . . . to . . . cure the sick negroes. The African sun is shining through the coffee-bushes into the dark shed; but we, black and white, sit side by side and feel that we know by experience the meaning of the words, "And all ye are brethren."

By experience indeed! Whether in studying the ways of the African or in seeking to write down the melodies of his native songs, to understand the nature of his diseases or, most important of all, to find a way by which to convey to the African the sense of a loving Father and to respond with compassion to the suffering of African men and women—these are a few of the things that Dr. Schweitzer has learned by experience.

George Seaver has given us a definite biography of Albert Schweitzer, one that all of us who live in a restless civilization ought to fathom and, so far as we are able, incorporate into our own lives.

EDWARD H. HUME

MAXENCE VAN DER MEERSCH. *Bodies and Souls.* Translated from the French by Eithne Wilkins. New York: Pellegrini and Cudahy, 1948. 654 pp. $3.75.

This 654 page novel—a typical "roman fleuve"—evolves around the neuropsychiatrist Jean Doutreval, a widower and professor in the fictitious medical faculty of Angers; his son Michel who marries a tuberculous patient and becomes a practitioner in the industrial North; his daughter Mariette, who marries one of the young careerists of the faculty and dies during a Cesarian; and his daughter Fabienne, a nurse, who doesn't marry at all, but has a child. Yet it is hard to decide whether Doutreval's colleague, the surgeon Bernard Geraudin, or the deputy and minister Olivier Guerran, both provided with rather unappetizing families, are not

just as much the heroes of the book, not to speak of the innumerable minor actors: professors, students, assistants, practitioners, patients who fill the scene. All these people are having a lot of trouble most of the time. C'est la vie. The novel plays in the clinics, hospitals, laboratories and fine residences of Angers and Paris, and among the poor of the North.

Although it is of secondary importance in a work of art, it seems appropriate to deal in a medical journal first with the factual value of the medical details in van der Meersch's book. As a whole the author, a "layman," has done admirably well along these technical lines. Minor errors and anachronisms are irrelevant. A rather faithful description is given of the situation in different medical institutions; of the diseases and operations involved; of the amount of competence and incompetence, idealism and greed encountered in the profession. That his picture is not always pretty, is not the author's fault. That conditions are in many ways better in this country than in France should not make us overlook the fact that the fundamental difficulties of combining high ideals with certain material necessities are the same here and there.

In one field the author has a special axe to grind, and is highly subjective, to say the least: the treatment of tuberculosis. A look at his portrait suggests that the author's adoption of the rather unorthodox Brunon-Carton dietary treatment of pulmonary tuberculosis is not merely theoretical, but based on painful personal experience. Van der Meersch now preaches this treatment—the exponent of it is called Domberlé in the novel—with the fervor of a cultist. Yet as this is only one aspect of a very rich book, I do not feel that it invalidates it as a whole, all the more as the treatment in question is not entirely absurd.

The dustcover rightly compares the author, a prix Goncourt winner, to Zola. While van der Meersch might not reach in this book the level of some of Zola's best works, he has the same incredible richness in detail, the same moving humanity, the same strength of characterization, the same candid idealism, the same sinister austerity. As with Zola and Balzac the "good people" have a tendency to come out a little to angel white; but aged sinners, repentant or not, like the psychiatrist, who tries to sacrifice his scientific integrity and his family to his ambition, or the aging master surgeon, who is unable to stop in spite of increasing failures, are full of tragic greatness. *This is a very fine novel, and was worthy of translation.* The translation is fluent, except for the attempt to invent equivalents for terms of the French medical hierarchy like "Fellows," "Faculty chiefs" etc. which are equally meaningless in both languages. It would have been preferable to preserve the original French terms like "chef de clinique" etc.

To those unfamiliar with modern French literature it will come as a surprise that this novel of social criticism does by no means culminate in leftist slogans, like social insurance etc.,—and here is a fundamental difference between our author and Zola—but is based rather on a certain religious, moralist and "rightist," "reactionary" attitude. Yet it is a fact that some literary exponents of the French right, more or less in the opposition throughout decades except for the unsavory Vichy episode, have developed often greater talent in criticising the abuses of society than most of the writers of the "left," which has become deeply involved with the present status through almost permanent participation in government.

ERWIN H. ACKERKNECHT

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